



AGRICULTURAL RESEARCH INSTITUTE
PUSA

JOURNAL
OF THE
NEW YORK
ENTOMOLOGICAL SOCIETY

Devoted to Entomology in General

Volume XIII, 1905

EDITED BY HARRISON G. DYAR

NEW YORK
PUBLISHED BY THE SOCIETY
QUARTERLY
1905

PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

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JOURNAL

OF THE

New York Entomological Society.

Vol. XIII.

MARCH, 1905.

No. 1

Class I, HEXAPODA.

Order II, COLEOPTERA.

THE NORTH AMERICAN SPECIES OF COTALPA.

BY H. F. WICKHAM,
IOWA CITY, IOWA.

Six species of *Cotalpa* have thus far been described from the United States, and two from Central America. None are known to occur south of Guatemala, nor does the genus appear in the Old World. Our species have been described at divers times, and while the genus has been tabulated twice by Dr. Horn, neither of his synopses is complete as to species and the discovery of a seventh form seems to indicate that a new table would not be out of place.

It will be noticed that our species divide readily into two series, according to the punctuation of the pronotum and the presence or absence of long hair on the upper surface of the body. This offers a convenient and apparently natural basis for primary division, much more readily appreciable than the structure of the mandibles and of the mentum, though these points are extremely useful in separating the species in later analysis. In fact, the species of *Cotalpa* are more easily recognized by direct comparison than by description, the differences in form being difficult of exact verbal diagnosis. The following scheme will serve for their recognition.

- A. Prothorax finely punctured, body above not hairy.
 - b. Head, pronotum and scutellum distinctly metallic, under surface and legs also with metallic reflections. Elytra yellowish.
 - c. Form more elongate. Outer edge of mandible nearly straight, inner apical angle with broad deflexed tooth, .80-.90 in. *consobrina* Horn.

cc. Form robust, outer edge of mandible broadly rounded.

Elytral punctuation fine, mostly well separated, .80-1.08 in.

lanigera Linn.

Elytral punctuation coarse and crowded, extensively confluent transversely, .68-.75 in.

suberibrata n. sp.

bb. Yellowish or testaceous above, with no metallic lustre; under surface piceous black, .90-1.00 in.

flavida Horn.

AA. Prothorax very coarsely punctured, body above hairy.

d. Prothorax very densely and confluent punctured, the hairs of this part very long, fine and abundant, .56-.72 in.

granicollis Hald.

dd. Prothorax deeply and coarsely but not conspicuously confluent punctured.

Larger (.85 in.). Mentum deeply emarginate.

puncticollis Lec.

Smaller (.52-.62 in.). Mentum rather feebly emarginate.

ursina Horn.

C. consobrina Horn, Trans. Amer. Ent. Soc., III, 1871, p. 337. Readily distinguished at sight from our other glabrous species, by the more elongate form of the body. The original specimens came from Fort Whipple, Arizona, but it is now known from several other points in the southern part of that Territory. I have taken it in numbers at light in Phoenix and Nogales, and in still greater abundance at Tucson, where it swarms about the arc-lights by the hundred. During the day I have met with it clinging to the smaller twigs of the "palo verde" on the hills near Tucson.

C. lanigera Linnæus, Systema Naturæ (Edit. X), 1760, p. 350. This common species occurs from Kansas eastward and exhibits considerable variation in size and in punctuation; the greater measurement cited in the table is taken from a specimen secured at Bayfield, Wisconsin, in which the sides of the prothorax are more rapidly and less arcuately narrowed behind than usual. This individual has the sides of the elytra subangulate, with a well marked tubercle in the angulation, like the females of *C. flavida*. Dr. Harris (Insects Injurious to Vegetation, p. 25) says that *C. lanigera* attacks the leaves of the pear, elm, hickory, poplar and probably other trees. It is frequently attracted to lights.

A curious variety of this species, with the label Prescott, Arizona, has been loaned me by Mr. Chas. Fuchs. While it has all the essential characters of *C. lanigera*, it is colored in such a manner as to present a totally different appearance. The metallic lustre of the head and thorax is more pronounced, the pronotum broadly brownish at the sides; the elytra are ornamented by a common brown sutural

stripe, extending the entire length, narrower at apex and extending along the basal margins to the humeri where it is recurved, giving somewhat the appearance of a broad T. I propose for it the name *Cotalpa tau*.

C. subribata n. sp. Form robust, as in *C. lanigera*. Above yellowish, head, pronotum and scutellum greenish with metallic reflections, pronotal margin dark green. Head densely, confluent punctured in the region of the clypeal suture, the punctures growing sparser towards the occiput, which is smooth and polished. Clypeus slightly transversely convex, margin narrowly reflexed, angles broadly rounded, front edge nearly straight, surface densely and somewhat confluent punctured. Mentum emarginate anteriorly, the lower face with two obtusely elevated ridges arising near the front angles and converging posteriorly. Terminal joint of maxillary palpi deeply impressed. Pronotum a little less than twice as broad as long, widest near the middle, base broader than apex, sides arcuate, not angulate, surface polished and with double punctuation; the larger punctures are distant and fairly uniformly distributed except near the sides, where they become crowded, the fine ones following the same general plan. The side margins thus acquire a rugulose appearance. Median line vague, visible only in certain lights. Scutellum green, rather coarsely punctured, more densely near the base. Elytra dull yellowish, not metallic, strongly, closely and subconfluent punctate over their entire surface. Body beneath dark green, shining, more or less metallic, thickly punctured and hairy, the middle of the abdomen less densely clothed than the rest. Legs yellow with metallic green reflections, tarsi darker. Length, .68-.75 inch.

This form is most nearly allied to *C. lanigera* Linn., but presents a very different appearance on account of the coarse and close punctuation of the elytra and the much smaller size. My specimens are all females, one of them showing the subangulate elytral margin with accompanying tubercle which is so well marked in *C. flavida* (and which occurs less frequently in *C. lanigera*) while in the other two structure is wanting.

Described from three specimens taken by Mr. Warren Knaus at Sedora, Kansas, in July. In response to inquiry, Mr. Knaus writes that all of his specimens from southwestern Kansas agree in the size and strong punctuation so characteristic of this insect.

C. flavida Horn, Trans. Amer. Ent. Soc., VII, 1878, p. 53. Of

the size and general appearance of *C. lanigera*, but easily separated by the lack of metallic lustre and the much stouter legs. Described from specimens taken by Dr. Palmer, at St. George, Utah. I have since collected it at the same place, in June. A good series, taken on willows at Green River, Utah, by Professor Arthur G. Smith, is also in my cabinet. Mr. Fuchs has sent me one from Prescott, Arizona.

C. granicollis Haldeman, Stansbury's Explorations and Surveys of Great Salt Lake, 1852, p. 374. The prothorax is brilliant green, and the extremely coarse, close, confluent punctuation gives it a scabrous appearance. The elytra are reddish brown, very hairy. Originally described from the valley of Great Salt Lake, but specimens are in my collection from northern Colorado, Nevada (Verdi), and Washington, (North Yakima). The Death Valley expedition took it in the Argus Mountains.

C. puncticollis LeConte, Smithsonian Misc. Coll., 167, 1863, p. 78. Described from New Mexico, whence I have a specimen loaned by Mr. Fuchs. Mr. Liebeck has examined the series in the Horn collection, and writes that the set contains six specimens from Arizona, besides the presumptive type from New Mexico. Some of these specimens have the elytra dark while in the others they are greenish yellow. The prothorax is bright green. The thoracic punctures are umbilicate, of irregular size and closely placed, though not confluent to the extent seen in the preceding species, and the hairs are coarse and sparse. The hairs of the elytra are also coarse and easily removed; they are arranged in comparatively regular series along the suture, the outer margin and the three discal costæ.

C. ursina Horn, Trans. Amer. Ent. Soc., I, 1867, p. 168. The smallest species of the genus, easily recognized by the deeply but not confluent punctured blue-black or greenish black prothorax and reddish elytra. It is a plumper form than *C. granicollis*. Occurs at various points in California and the Peninsula. According to Professor Fall, it flies by day and may sometimes be seen in quantities, clinging to cypress hedges.

THE DEVELOPMENT OF WINGS OF CERTAIN BEETLES, AND SOME STUDIES OF THE ORIGIN OF THE WINGS OF INSECTS.

By P. B. POWELL.

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(Continued from Vol. XII, page 243.)

The downward growth of the wing continues until early in the prepupal period, when it reaches the base of the leg bud, which prevents further growth in this direction (Figs. 8, 21). The wing now exists as a double-walled pad lying between the hypoderm and cuticle, extending downward and backward, as far as the base of the leg and with the basement membranes of the two layers usually closely pressed together, except at the places where tracheæ have entered the wing, forming vein cavities. The nuclei of the two walls still lie at several different planes and the outer (upper) wall is somewhat the thicker, while the bases of the cells are abruptly narrowed and thread-like.

The later stages in the development of the wings of *T. plastrographus* and of *D. valens* are very much as have been described by various authors for the Coleoptera and Lepidoptera. With the beginning of the prepupal period the growth of the wing becomes accelerated. With the lengthening of the wing the nuclei begin to be drawn up into one row near the outer ends of the cells, while the cells themselves become very much elongated and drawn out in places (Figs. 9, 10). Shortly before pupation this process becomes completed and the cells have the characteristic "fringed" appearance of the pupal hypodermis described by Verson (1904). The wing is now greatly wrinkled and folded, the vein cavities are greatly enlarged and filled with hæmolymph and leucocytes, both of which also circulate in the spaces between the elongated cells. The basement membrane, which throughout the development of the wing is very thin and not easily discernable, becomes more or less degenerated during the prepupal period and in places the bases of the cells either end free (Fig. 19), or become fused and anastomosed with each other (Figs. 11, 22).

Early in the last stage there is secreted all around the body, underneath the dense outer chitin, an inner layer of soft spongy or stringy

chitin which takes a faint stain with hæmatoxylin. This chitin is especially pronounced around the wing buds, which it entirely surrounds, at first more or less completely filling the cavity between the wing and the hypodermis.

(d) *Formation of the Veins.* — At about the beginning of the prepupal period, or shortly before, the vein cavities begin to be formed. Several branches arise from the trachea at the base of the wing and push into the wing pad, the two layers of the basement membrane separating as the trachea enters (Fig. 38). At the same time that the tracheæ enter the wing the tracheoles uncoil and accompany the tracheæ. This manner of the formation of the veins, which I have observed in *T. plastographus* and *D. valens* and also in *Bruchus* sp. and the Pepper beetle, differs from the account of Tower, who found that the cavities were formed before the tracheæ develop and enter the wing, whereas, so far as I have been able to observe, the development of the two is coincident.

3. THE TRACHEAL SYSTEM.

According to Comstock and Needham, working on *Hippodamia 13-punctata*, there are in the wings of Coleoptera, as has been so often shown to be the case in the Lepidoptera, two systems of tracheation, a temporary system of tracheoles, and the permanent wing tracheæ, which develop after entering the wing a system of tracheoles of their own; the temporary system of tracheoles being much less highly developed than in the Lepidoptera. The permanent tracheæ enter the wing during the last larval stage, when the wing is well developed and at the beginning of its rapid extension.

While they found the two distinct systems in the Coleoptera, they found that in wings developing externally like those of a dragon-fly, "the principal tracheæ pass out very early into the wing bud, branching freely and forming by multitudinous terminal anastomoses a network of capillary tracheoles," no temporary tracheoles being found. They believe that the development of the latter is due to and depends on the confinement of the wing within narrow quarters inside the body and to its small size. Their observations on the Coleoptera were corroborated by the researches of Tower. I have found evidence leading me to the conclusion that there is no fundamental difference between the development of the tracheoles and that of the tracheæ, but that the two systems merge into one another. I will reserve this, however, for a later communication.

(a) *The Tracheoles*. — In all the larvæ that I have examined there is from the very beginning a close connection between the wings and the tracheal system. Comstock and Needham found (in *Hippodamia 13-punctata*) that the wing fundament had at first "no connection with or approximation to any trachea," this connection not occurring until the wing disc had invaginated well into the body, approaching a lateral tracheal trunk, and evagination had begun. Needham found that in *Mononychus vulpeculus* the wing bud differed from the leg bud only in having no tracheæ at or near its inner surface. This I think is an unusual condition and not to be found in many Coleoptera. In all the Coleopterous larvæ examined by Tower (1903), even in the earliest stages the wing fundament received a distinct branch from the tracheal trunk; a similar condition was found in the Lepidoptera by Mercer (1900).

In the earliest stages of the wing, in *T. plastographus* and *D. valens* and in a Buprestid, even before the fundament becomes recognizable in some specimens, two branches extend from the tracheal trunk to the hypodermis at the place where the wing fundament is shortly to arise. Sections of larvæ taken at this time show the tips of these tracheal branches abutting directly against the bases of the cells of the newly forming wing, the tracheal cells proliferating and spreading out over the inner face of the disc. A mass of cells is thus formed, the walls of which are either very thin or more or less degenerated and in this mass of cytoplasm and nuclei, forming tracheoles are to be seen (Figs. 2, 3, 23). In some cases (*T. plastographus*) the tip of the tracheal branch, when it touches the wing disc, apparently pierces the basement membrane (Fig. 5) and then spreads out directly against the bases of the cells of the disc as a mass of cells, in the cytoplasm of which tracheoles are developed as fine somewhat coiled tubes (Figs. 5, 6). In other specimens the basement membrane apparently degenerates so that the bases of the cells of the disc are free. I have seen this in *D. valens* (Fig. 23). Occasionally the tracheæ push into the disc so that they are nearly surrounded by the cells of the latter (Fig. 1). Fig. 5 (*T. plastographus*) is a section through the disc of the fore wing near its cephalic margin, just after the last moult and shows a tracheal branch pushing through the basement membrane and spreading out under it.

My observations confirm those of Tower and Mercer that the tracheoles are formed from the cytoplasm of the tracheal cells and not

from their nuclei. The manner of development of the tracheoles is the same in all the beetles examined. Figs. 3 and 23 show an early stage in their development. From these figures it will be seen that they are formed as long curved and coiled tubes. As the cytoplasm of the tracheal cells becomes used up in their development, these tubes become looped around the nuclei and by the time that the wing is well evaginated the greater part of the cytoplasm of the cells has been used up and we find a mass of large tracheoles looped and coiled around the nuclei (Fig. 7), nearly every nucleus being closely enfolded by a tracheole.

The tracheoles are present throughout the larval development of the wing and probably degenerate some time during the pupal period. Fig. 17 shows a bundle of tracheoles extending into the base of a wing in the prepupal period. Figs. 13, 15 and 16 show tracheoles that have developed from the wing tracheæ after their entrance into the wing. I have not observed the earliest stages of the formation of these secondary tracheoles, but it will be seen from these figures, which were drawn from the same wing as Fig. 17, that there is no difference in the structure of the primary and the secondary tracheoles. In fact the two cannot be distinguished when in the wing.

The simplest condition of the tracheoles was found by Tower to be in *Coccinella bipunctata*, in which a few tubules developed from the tracheal trunk at irregular intervals, while the most specialized condition was found in the Buprestidæ. My observations confirm those of Tower that the most specialized condition of the tracheoles is to be found in the Buprestidæ, but I find, however, that as in *T. plagiographus* and *D. valens*, the tracheoles begin to develop as soon as the wing disc, and are fully formed, as a mass of tubes which are very small next the wing disc, becoming larger further out, by the time that the wing begins to evaginate (Fig. 19).

The tracheoles in the Coleoptera are of a simpler type than is found in the Lepidoptera as described by Gonin (1894), Mercer (1900) and others. Mercer found the tracheoles beginning to develop during the fourth larval stage and becoming functional after the next moult, at the beginning of the last stage. In the Coleoptera, according to Tower, they do not begin to develop until the wing is well formed, during the last larval stage, becoming functional early in the prepupal period and without a moult. I have not been able absolutely to determine the time of their becoming functional in the bee-

tles worked on, but it seems certain that they do so at an early stage in the development of the wing, probably at the moult preceding the evagination of the wing, and their main purpose is to supply the disc with an abundance of air at this important stage of its development.

(b) *The Tracheæ of the Wing.* — Shortly before the beginning of the prepupal period, several branches arise from the main trachea and push into the wing, extending nearly to its margin. These are the permanent wing tracheæ, and they are accompanied into the wing by the tracheoles, which begin to uncoil at this time. These tracheæ correspond in number and general position to the veins of the pupal and adult wing, and their early development, taking place soon after the evagination of the wing begins, is similar to what occurs in the wings of Heterometabolous nymphs. According to Comstock and Needham, "in wings developing externally like those of a dragon-fly one sees the principal tracheæ passing very early out into the wing bud, branching freely and forming by multitudinous terminal anastomoses a network of capillary tracheoles. In the beetle wing these fine tracheæ and tracheoles follow rather closely the course of the vein cavities, and are most readily seen by an external examination of the wing just after pupation.

III. THE ORIGIN OF THE WINGS.

The question of the origin of the wings of insects is one over which there has been much controversy. In all insects the wings first become recognizable as slight thickenings of the hypodermis in the pleural region near the place where the suture arises between the dorsum and the pleurum, but whether they have been modified from some other structure or have been developed as entirely new structures is uncertain.

There have been three theories advanced to account for the origin of the wings of insects:

1. That they have been developed from tracheal gills.
2. That they have arisen as lateral outgrowths of the tergum or pleurum of their respective segments.
3. That they arise from degenerated spiracle discs of the meso- and metathorax.

The theory that the wings of insects have arisen from tracheal gills was first advanced by Gegenbauer and adopted by Lubbock and has since been advocated by Pratt (1897). This theory, of course,

presupposes that the ancestors of the winged insects were aquatic forms and that still farther back in the line of descent the pregenitors of these aquatic forms must have been terrestrial, in order to have evolved a tracheal system in the body, from which later, tracheal gills could be developed; as otherwise, if gills had been developed at all by these primitive insects they would certainly have been blood gills.

But all the evidence points strongly to the supposition that the ancestors of the winged insects were terrestrial. It has been shown by Packard (1898) that tracheal gills are adaptive, secondary, temporary larval structures that do not persist in the adult and "are not ancestral, primitive structures." Tower also rightly objects that there is no resemblance between the fundamental type of wing venation, as established by Comstock and Needham, and the tracheation of any known tracheal gill, which should certainly be the case if the wings had been developed from any such structure.

The second theory and the one to which it seems to me that all the present evidence points strongly is the one put forward by Graber (1867) and Muller (1875) and strongly supported by Pancritius (1884) and Packard (1898), that the wings have arisen as simple outgrowths or evaginations of the integument at the suture between the dorsum and the pleurum. After working on the development of the wings in the Termites, Muller declared that the wings of insects have been derived from lateral continuations of the dorsal plates of their respective segments.

I have shown that in the Coleoptera the wing arises on the pleurum, at or near the future position of the dorso-lateral suture, as a thickening of the body wall, which, in the simplest type, begins as a simple pushing outward and downward of this thickening (Fig. 4). In another paper I shall show exactly the same process in the beginning wing of the Neuropteran, *Raphidia* sp. the wing developing as an outpushing of the thickened hypoderm at the lateral fold. In certain Hemiptera, sections of the early stages of which I have examined, it was evident that the wing developed as a simple pushing out and folding of the body wall near the lateral suture.

All this is in line with the conclusion of Packard (1898) that "the wings are essentially simple dorsal outgrowths of the integument, being evaginations of the hypodermis," and of Comstock and Needham (1899) that the "wings arise as sack-like folds of the body wall at the point where the suture between the tergum and the pleurum

later develops. In most insects with an incomplete metamorphosis they are so directly continuous with the tergum and become so solidly chitinized with it that they have generally been interpreted as outgrowths from its caudo-lateral margin." Muller (1875) has shown that in *Calotermes* the wings arise on the meso- and on the metathorax in same position and cannot be distinguished in their early stages from the prominent lateral fold that develops on the prothorax.

In every insect, both in the Holometabola and in the Heterometabola, in which the early stages of the wing development has been investigated, it has been found that the wing arises in a homologous position on the pleurum and that in the simplest types it develops as a simple outpushing of the hypodermis. In fact, in *T. plastographus* and in *D. valens* in their early stages the wing discs are exactly like the leg discs and have a similar mass of tracheoles at their base. While it is not doubted but that the legs have been developed from folds or outpushings of the hypodermis, there is no more reason to believe that the wings have developed from spiracles or in some other circuitous manner than there is in the case of the legs.

The third theory, which was advanced by Verson (1890, 1894), is that the wings develop from the discs of the degenerated spiracles of the meso- and metathorax. This theory has been strongly supported by Tower (1903).

Wheeler (1889), working on a Chrysomelid beetle, *Leptinotarsa 10-lineata*, observed that during the development of the embryo, every segment of the thorax and abdomen develops a spiracular invagination, that these invaginations send off branches some of which unite to form the lateral tracheal trunk, that after the formation of the trunk the prothoracic spiracle closes over and disappears, which is also the case with the metathoracic spiracle, while the mesothoracic spiracle is situated near the suture between the pro- and mesothorax "and in later stages often has the appearance of belonging to the first segment." These observations were confirmed by Tower, who makes the additional statement that in the migration cephalad of the mesothoracic spiracle, "the spiracle alone migrates and the thickened area of the hypodermis remains and probably becomes the fundament of the elytron." He says that after the formation of the longitudinal tracheal trunks "the openings in the meso- and metathorax are rapidly cut off, leaving a disc-shaped mass of cells which have a somewhat concentric arrangement. The further stages in the degeneration of

these spiracles I have not been able to observe. That this rudiment of the spiracle is converted into the imaginal disc of the wing seems probable, however, for the following reasons: (1) The disc of the wing always appears in exactly the same area as that in which the spiracle arose and degenerated, (2) the wing disc frequently shows a concentric arrangement of the cells in early stages but loses this before invagination to form the wing begins, (3) if the wing fundement is not derived from the remains of the spiracle, then, since the wing disc has the exact position occupied by the spiracle, the latter must entirely degenerate and be replaced by new hypodermis, and from this the wing must arise. There is, however, absolutely no ground for belief in such a process and the only conclusion that seems at all tenable is that the wing fundement is derived directly from the remains of the spiracle." Tower states farther that these spiracle discs are quite distinct in the embryo shortly before hatching, but that soon after the larva emerges they either degenerate or subside into a quiescent period so that they are not recognizable from the surrounding hypodermis, but that after this period of rest, the cells begin to grow again and form the wing fundement.

I shall present what, I think, is conclusive evidence that the wings do not arise from discs of degenerated spiracles, but which points strongly to the supposition that the wings have originated as outpushings of the hypodermis at the suture between the pleurum and the tergum.

I have found (1) from the examination of a large number of species of Coleopterous larvæ that the mesothoracic spiracle is present in many species and that in some of these it is functional, while in others the connection with the longitudinal tracheal trunk has more or less completely degenerated but that the spiracle itself is present though considerably smaller than the other spiracles and but lightly chitinized. (2) That in the larvæ of some winged insects possessing both meso- and metathoracic spiracles these spiracles have not migrated forward to any appreciable extent, in some cases occupying exactly the same positions in their respective segments that the abdominal spiracles occupy in their segments. (3) That the wing fundement arises distinctly either above or below the positions occupied by the thoracic and abdominal spiracles. That is to say, the positions of the spiracles on the pleuræ of their respective segments varies in different insects, being in some cases distinctly below the origin of the wing and in others distinctly

above the wings, and that they generally lie in the cephalic half of their segments, while the wing fundament is centrally situated on its segment. (4) If it can be proven that in any winged insect the mesothoracic and metathoracic spiracles are present and functional, it seems certain that the wings have originated independently of the spiracles and not from any spiracle disc, since it seems pretty hard to believe, as has been stated by Tower, to be the case with the mesothoracic spiracle, that the spiracles migrate forward while the discs remain behind; that is to say, the chitinized opening alone moves forward and new hypodermal cells become specialized and take on the function of secreting the chitin of the spiracle, while the old cells (disc) remain behind and later develop into a wing.

1. *The Spiracles.*

In the primitive insects, the ancestors of our present winged forms, a pair of spiracles was present in each of the three thoracic segments, as well as in each of the first nine abdominal segments. The presence or absence of certain of these spiracles and their position on the segments has an important bearing on the theory of the origin of the wings from spiracle discs.

While the prothoracic spiracle is present in the embryo, as has been shown by Wheeler, it entirely degenerates and is not known to be present in the larva or adult of any winged insect. In the Lepidoptera however it is said to have been transformed into the spinneret.

The mesothoracic spiracle is always present and open except in some aquatic larvæ. This spiracle has often been called the prothoracic because it has often migrated into that segment, but that it is really the mesothoracic has been proved by Wheeler (1899), whose observations have been confirmed by Tower (1903). This is usually the largest of all the spiracles, but in the aquatic forms, many of the Odonata, Ephemera and Diptera, this, as well as all the other spiracles of the body are closed or nonfunctional, reappearing as functional spiracles in the adult insect.

In the larvæ of many insects the metathoracic spiracle has entirely degenerated, but this is by no means the rule. Among the Coleoptera it has been proved by Graber (1888) for *Melolontha* and *Lina* and for *Doryphora* by Wheeler (1899) that it is present in the embryo. They found however that this spiracle degenerated before the larva emerged from the egg. Complete degeneration however

does not always take place. A careful external examination will show, in the larvæ of many beetles, that the metathoracic spiracle is present, though usually much smaller than the other spiracles and generally much less heavily chitinated, so that it is quite inconspicuous and easily overlooked and it is in many cases evidently closed or non-functional, at least during the larval state. I have found the metathoracic spiracle present in the larvæ of a Trogositid, *Thymalus marginicollis* (*fulgidus*) (Fig. 25), of a Pyrochroid sp., of an Erotylid sp. (Fig. 26), in the larvæ of several unknown Tenebrionidæ, Carabidæ and Cerambycidæ. In the larvæ of the Scolytids *T. plastographus* and *D. valens* (Figs. 32, 33) I have been unable to find the spiracle by external examination, but cross-sections of the metathorax at the place where the spiracle should be show the spiracular branch extending out from the lateral tracheal trunk entirely through the hypodermis (Fig. 12) and they are probably functional. In the larva of *Thymalus marginicollis* the metathoracic spiracle can be plainly seen as a small oval disc with a slit in it and it is probably functional (Fig. 25). Breed (1903) has figured this spiracle in both the larva and the pupa of this beetle. In the larva of the Erotylid sp. (Fig. 26) this spiracle is even larger and though considerably smaller than the other spiracles is undoubtedly functional.

In larvæ that are light colored and not heavily chitinated, such as many of the wood borers, the tracheal system can usually be well brought out by clearing in cedar oil. Fig. 24 shows the lateral tracheal system of a larva thus prepared, of a Ptinid, *Ozognathus cornutus*. It will be seen that under the metathoracic and each of the abdominal spiracles there is a tracheal center, that is, the group of tracheal branches which, in the embryo, arose from the end of each spiracular invagination and ramified in all directions. Although, on account of the small size of the larva, I could not make out with certainty a spiracular opening in the metathorax, there is a tracheal center under the spot where this spiracle should be, which is larger than any in the abdomen except the first and it is not probable that this would be the case if there were no functional opening. It will be seen that, while the mesothoracic spiracle has migrated forward into the suture, the tracheal center migrated with it, while the metathoracic tracheal center is distinctly in the metathorax and occupies nearly the same position in its segment as is occupied by the abdominal centers in their segments.

Among the Hymenoptera I have found the metathoracic spiracle present in the larvæ of the honey bee, *Apis mellifica*, of a wood-boring wasp and of an undetermined mud-wasp. In all cases this spiracle is not to be distinguished from the other spiracles of the body, either in shape, size or position.

I have also found vestiges of the metathoracic spiracle present in the larva of the silk-worm, *Bombyx mori*.

In the Neuroptera I have found the metathoracic spiracle present and open(?), though small, in the larva of *Raphidia* sp., and also in the pupa.

There are numerous references in entomological literature to two pairs of thoracic spiracles. Among the Coleoptera both meso- and metathoracic have been recorded for the larva of *Elmis* (Parnidæ) and *Lycus* (Lampyridæ) (Packard). In the Hymenoptera both pairs are present in the Aculeata and in the Siricidæ, though in the latter the metathoracic is sometimes closed. Both spiracles are also present in *Apis* and *Hylotoma* (Packard). Packard figures the larva of *Bombus* with a full-sized metathoracic spiracle and Bugnion has done the same for *Encyrtus fuscicollis*. Packard also figures a meso- as well as a metathoracic spiracle in a locust, *Melanoplus femur-rubrum*. Calvert (1893) has found that in all the adult Odonata the metathoracic spiracle is present and very distinct. In those insects, the larval stages of which are passed in the water and which develop tracheal gills (Odonata and Ephemera), thoracic gills are present and open in the early larval stages, but later become closed (Packard). Both pairs of spiracles have been shown by various authors to be present in the Hemiptera. Among the Diptera both pairs are present in the larvæ of Bibionidæ and Cecidomyidæ (Miall and Hammond). Both pairs are present in the Termites.

2. *The Position of the Thoracic Spiracles and their Relation to the Wing Discs.*

During embryonic life the spiracles are formed as invaginations on the pleuræ of their respective segments at a point nearly midway between the middle of the segment and the suture in front of it. This embryonic position of the spiracles can be readily seen by reference to the figures of Graber (1891) who worked on the embryonic stages of the Lepidoptera, Coleoptera and Orthoptera and the figures of Wheeler (1889) for the Coleoptera. The mesothoracic spiracle often migrates

forward so that in the larva it lies in the suture or even in the prothorax. This is especially true of the Lepidoptera. The metathoracic spiracle, when present, sometimes migrates forward as far as the suture, while the abdominal spiracles as a rule, remain very nearly in their embryonic positions.

In the Coleoptera the mesothoracic spiracle usually lies in or near the suture between the pro- and mesothorax (Figs. 24, 25), but in many cases it is distinctly in the mesothorax and in some species there is little or no migration (Fig. 26). Its position corresponds very nearly to that of the mesothoracic (Figs. 25, 26), but I have never found it entirely in the mesothorax.

The height at which the spiracles are situated on the pleurum is a little below the place where, later, the suture is formed between the dorsum and the pleurum and is always distinctly below the wing discs (Fig. 31). The latter arise near the future sutural line and are always centrally situated on their segments, while the spiracles lie in the front part. Their relative positions can be determined by certain muscles occurring in each segment. In certain Hymenoptera, however, the spiracles are situated at some distance above the wing discs.

Vestiges of the metathoracic spiracle are to be found in the larvæ of some Lepidoptera. An external examination of the silk-worm (*B. mori*) will reveal the remains of this spiracle as a small, oval, faintly-chitinized ring, occupying a position on the pleurum of the metathorax near the suture between that segment and the mesothorax and in a position very nearly corresponding to that of the first abdominal spiracle on its segment, as will be seen by reference to Fig. 27 (drawn from a larva killed after the second moult and cleared in cedar oil). This shows the lateral tracheal system of the thoracic and first abdominal segment and the forming wing buds. It will be seen that the latter are centrally situated on the sides of their respective segments and dorsad of the longitudinal tracheal trunk. A small tracheal branch arising near the first abdominal spiracle pushes forward to the metathoracic wing disc, where it is met and joined by another small branch arising near the metathoracic spiracle. Two tracheæ arising similarly, near the meso- and metathoracic spiracles respectively, join at the center of the mesothoracic wing disc (Fig. 27). These two tracheal branches probably give rise, the one to the radio-medial and the other to the costo-anal groups of wing tracheæ. It is evident from the position of these wing discs that they have not arisen from any

part of the spiracles. The metathoracic wing disc is not situated over the tracheal center of its segment, while the remains of the metathoracic spiracle does lie over this center. The mesothoracic spiracle has migrated forward into the prothorax, but it is evident that not only the opening but the spiracular disc, as well as the tracheal center have migrated forward. Moreover, the metathoracic spiracle has not migrated, or at least very slightly, as will be seen by comparing its position with that of the first abdominal spiracle; so that it is not possible that either the meso- or metathoracic wing should have arisen from any part of a spiracle.

While, among many of the orders of insects, the metathoracic spiracle is in a more or less vestigial condition, being either considerable smaller, or entirely degenerated, it is to be found in the Hymenoptera, full sized and perfectly formed. In this order the positions of the wings and the spiracles in respect to one another are different from anything that I have found in any of the other orders. In the larva of the honey-bee (*Apis mellifica*) the metathoracic spiracle is as large as any of the other spiracles and cannot be distinguished from them in shape. The meso- and metathoracic spiracles and the abdominal as well occupy positions on the pleurum near the front margin of their respective segments, while the wings are centrally situated on their segments and arise considerably below the spiracles, as may be seen by reference to Figs. 28, 29. This is just the reverse of their position in the Coleoptera and Lepidoptera, in which, I have shown (Fig. 27), the wing discs are distinctly above a line drawn through the spiracles, while in *Apis*, the base of the wing bud is below the spiracles, at about one third the distance between them and the leg buds (Figs. 28, 29). This can be easily seen by an external examination of the larva, as the wing and leg buds lie outside the hypodermis, next the cuticle and can be readily seen through it. The tracheal centers under each spiracle are greatly reduced, there being only a few small branches which soon break up into a fine network of small tracheæ or tracheoles. We find in *Apis*, just as we did in the Silkworm, a small trachea running from the tracheal center behind each wing bud and meeting at the base of the bud a similar trachea coming from the tracheal center in front of the wing. I believe this will be found true of all winged insects, while from these two tracheæ evidently develop, respectively, the two groups of wing tracheæ.

V. CONCLUSION.

It has been shown in this paper that among the Coleoptera are to be found examples of the simplest type of wing development known to occur in the Holometabola, while this type differs from the development of the wings in the Heterometabola mainly in that it is held closely to the side of the body until pupation, and that in the Scolytidae and in certain Bruchidae and Buprestidae, the development of the wing takes place without any preliminary invagination of the center of the disc or recession from the cuticle. It has been shown, also, that there is a distinct system of tracheoles developed at the base of the wing, the first appearance of which is coincident with the forming of the wing disc, and that these tracheoles cannot be distinguished from those that arise within the wing from the permanent tracheae, during the prepupal period.

I have shown conclusively that the wings do not arise from any part of the spiracles of the mesothorax or metathorax, nor do the spiracles and the wings arise from the same place on the pleurum, even in those insects in which the metathoracic spiracle degenerates. But that the spiracles arise in the embryo in a different position from that in which the wings arise, while in many insects the metathoracic spiracle does not degenerate.

In those insects possessing tracheal gills, these gills are developed in larval or pupal life and are temporary, adaptive structures that do not persist in the adult, while there is no evidence whatever to show that the wings have been derived from any such structure possessed by the ancestors of the winged insects.

On the other hand, the only conclusion that seems at all reasonable, and the one to which the earliest stages in the formation of the wing in all insects seems to point, is, that the wings have been derived as lateral outgrowths or folds of the hypodermis of the pleurum or tergum, or both.

METHODS.

In preparing the material for these investigations several different methods were tried. Among the fixing solutions, the best results were obtained with a saturated solution of corrosive sublimate in ten per cent. formalin, washed out with four per cent. formalin. Very good results were also obtained by the use of Tower's No. 3, the formula for which is as follows:

Sat. sol. HgCl_2 in 35 per cent. alc.	60 vols.
Glacial acetic acid (99.5 per cent.)	10 "
Platinic chloride 2 per cent. sol. in aq. dest.	30 "

This can be used either warm or cold, while the material should be cut into as small pieces as possible.

Out of a number of different stains tried, I selected Ehrlich's acid hæmatoxylin as the best all round stain for the wings and other hypodermal tissues, though Delafield's hæmatoxylin gave good results and iron hæmatoxylin worked well in some cases.

EXPLANATION OF PLATES XI-XVII, VOL. XII.

All the figures used in this paper were outlined with a camera lucida and the details put in with free hand. The figures are arranged dorsal side up, and the anterior surface toward the reader.

Abbreviations used in the figures :

<i>b</i> , basement membrane.	<i>s</i> ₁ , mesothoracic spiracle.
<i>c</i> , head.	<i>s</i> ₂ , metathoracic spiracle.
<i>cl</i> ₁ , old cuticle.	<i>s</i> ₃ , first abdominal spiracle.
<i>cl</i> ₂ , new cuticle.	<i>s</i> ₄ , last abdominal spiracle.
<i>cl</i> ₂ , secondary cuticle.	<i>set</i> , seta.
<i>f.b</i> , fat body.	<i>tr</i> , trachea.
<i>h</i> , hypodermis.	<i>tr.cl</i> , tracheal cells.
<i>h.sp</i> , spur of hypodermis.	<i>tr'ol</i> , tracheole.
<i>l.b</i> , leg bud.	<i>tr'ol.w</i> , wing tracheole.
<i>le'cy</i> , leucocyte.	<i>tr.cr</i> , tracheal center.
<i>l.tr</i> , lateral tracheal trunk.	<i>w.d</i> , wing disc.
<i>ms</i> , muscle.	<i>w.b</i> , wing bud.
<i>nc</i> , nucleus.	<i>w.l</i> , wing lumen.

Fig. 1. *Tomicus plastographus*. Just starting wing disc, showing tracheæ partly surrounded by cells of the disc. From cross-section of larva in the middle of the second stage.

Fig. 2. *T. plastographus*. Not quite frontal sagittal section of wing disc, showing forming tracheoles at base of disc. From larva in middle of second stage.

Fig. 3. *T. plastographus*. Wing disc, showing the pronounced folding and ridging of the cells. From cross section of larva just before second moult.

Fig. 4. *T. plastographus*. Wing disc just beginning to evaginate. From cross section of larva soon after second moult.

Fig. 5. *T. plastographus*. Cross-section of wing near cephalic end, showing trachea pushing through basement membrane, the cells spreading out underneath it and tracheoles beginning to form. From larva just after second moult.

Fig. 6. *T. plastographus*. Cross-section through middle of same wing from which Fig. 5 was taken, showing forming tracheoles and the bases of the cells beginning to elongate and separate.

Fig. 7. *T. plastographus*. Cross-section of wing well evaginated, showing thread-like bases of cells and tracheoles well developed.

Fig. 8. *T. plastographus*. Cross-section of wing through a vein cavity, showing wing extending to base of leg bud.

Fig. 9. *T. plastographus*. Cross-section of wing, showing beginning of folding of wing and the pulling of the nuclei into one row. Tracheæ and tracheoles in the vein cavities.

Fig. 10. *T. plastographus*. Cross-section of part of wing from same larva as Fig. 9, showing elongated bases of cells and tracheæ and tracheoles in vein cavity.

Fig. 11. *T. plastographus*. Full grown wing, shortly before pupation.

Fig. 12. *T. plastographus*. Cross-section through the metathoracic spiracle. (The cuticle was pulled away from the hypodermis during sectioning.)

Fig. 13. *T. plastographus*. Tracheole from full grown wing.

Fig. 14. *T. plastographus*. Tracheoles formed around the nuclei, from base of wing just before second moult.

Figs. 15 and 16. *T. plastographus*. Tracheoles from prepupal wing.

Fig. 17. *T. plastographus*. Bundle of tracheoles entering wing. From larva in prepupal period.

Fig. 18. Just starting wing disc of a Buprestid.

Fig. 19. Wing disc just beginning to evaginate, showing great proliferation of tracheoles. From same Buprestid as Fig. 18.

Fig. 20. *Bruchus* sp. Cross-section of wing well evaginated, showing trachea in vein cavity and the thick walls of the wing bud.

Fig. 21. *Bruchus* sp. Wing at a later stage than Fig. 20. The basement membrane has nearly degenerated.

Fig. 22. *Dendroctonus valens*. Full-grown wing shortly before pupation.

Fig. 23. *D. valens*. Forming wing disc, just before last moult, showing folding of the disc and the tracheoles at base.

Fig. 24. *Osoagnathus cornutus*. Lateral tracheal system from a larva cleared in cedar oil.

Fig. 25. *Thymalus marginicollis* Chev. Lateral view of front part of body of a full-grown larva, showing metathoracic spiracle.

Fig. 26. Lateral view of meso- and metathorax of a larva of an Erotylid, showing meso- and metathoracic spiracles and their positions.

Fig. 27. *Bombyx mori*. Lateral view of larva just after second moult, cleared in cedar oil, showing lateral tracheal system of thorax, the vestiges of the metathoracic spiracle and the wing discs.

Fig. 28. *Apis mellifica*. Lateral view of head, thorax and first abdominal segment, showing the leg and wing buds as seen through the cuticle, and their relation to the spiracles. From larva one half grown, cleared in cedar oil.

Fig. 29. *Apis mellifica*. Larva (prepupal period early) showing relative positions of spiracles and wing buds, as seen through the cuticle.

Fig. 30. From same larva as Fig. 29. Ventral view showing wing and leg buds.

Fig. 31. *Tomicus plastographus*. A not quite cross-section of a larva just before last moult, showing hinder margin of metathoracic wing disc and part of first abdominal spiracular trunk, to illustrate the relative heights on the pleurum of the spiracles and wing discs.

- Fig. 32. *T. plastographus*. Full grown larva; side view.
Fig. 33. *Dendroctonus valens*. Larva; side view.
Fig. 36. *Dendroctonus valens*. Cross-section of wing disc, showing an early stage of the evagination.
Figs. 34, 35 and 37. *Tomicus plastographus*. Early stages in the evagination of the wing.
Fig. 38. *T. plastographus*. Cross-section of wing bud showing thread-like bases of the cells and a trachea pushing into the wing. From larva at about the beginning of the prepupal period.

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Class I, HEXAPODA.

Order IV, DIPTERA.

A SYNOPTIC TABLE OF NORTH AMERICAN MOSQUITO LARVÆ.

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I have had this table in hand for over a year, but have been dissuaded from printing it by Dr. Howard, who advised delay on the ground that new forms were continually being found. Now, however, we have at hand all the larvæ of the known species of the Atlantic Coast region with the exception only of a few rare or doubtful forms, namely *Culex niveitarsis* Coq. and *C. onondagensis* Felt, recently described, *Anopheles nigripes* Staeg., *A. bifurcatus* Linn. and *Culex squamiger* Coq., of doubtful or recently recorded occurrence and *Culex hirsuteron* Theob. and *C. testaceus* Wulp., of doubtful identity.

There are a number of Western species still unknown in the larva, while the West Indies and Mexico as well as the Arctic regions are largely unexplored. Still, as the table seems likely to be useful in its present form for the Eastern United States, it is herewith presented.

1. Mouth hairs in a pair of pencils folded outward and hooked at tip; larvæ predaceous..... 2.
Mouth hairs diffusely tufted, folded inward, not hooked; larvæ not wholly predaceous, feeding on vegetable matter..... 3.
2. Lateral comb of the eighth segment a patch of spines..... *Psorophora ciliata*.
Psorophora howardii.
A lateral plate on the eighth segment..... *Megarhinus portoricensis*.
Megarhinus rutilus..... 4.
3. Air tube short, sessile, larvæ floating at surface of water..... 4.
Air tube longer than wide; larvæ floating below surface..... 7.
4. Teeth of comb of equal length..... *Anopheles barberi*.
Teeth of comb of two sizes, long and short..... 5.
5. Teeth of the lateral comb with large branches within..... *Celia albipes*.
Teeth of the comb with fine, obscure pectination only..... 6.
6. Secondary teeth of the comb less than half as long as the primary ones.
Anopheles crucians.
Anopheles maculipennis.
Secondary teeth of the comb over half as long as the primary ones.
Anopheles punctipennis.
Anopheles franciscanus..... 7.
7. Air tube linear on its outer half, armed with hooks.... *Teniorhynchus perturbans*.
Air tube conical, fusiform or straight, regularly tapered..... 8.
8. Abdominal hairs short stellate tufts; body pilose..... *Howardina walkeri*.
Hairs of the first two abdominal segments long, the rest short, stellate.
Uranotenia sapphirina.
Uranotenia socialis.
Uranotenia loewii..... 9.
9. No ventral brush; anal processes two, dilated..... *Wyeomyia smithii*.
Ventral brush present..... 10.
10. Anal processes two; tube short with row of hair tufts; antennal tuft outward.
(*sp. Bahamas*)..... 11.
- Anal processes four or none; not two..... 11.
11. Air tube short, 3×1 or less, or if longer with but a single hair tuft; antennal tuft at the middle of the joint without set-off..... 12.
Air tube long, 4×1 or over, with usually many hair tufts beyond the pecten; antennæ with the terminal portion slender, the tuft usually beyond the middle..... 49.
12. Antennæ bent S-shaped, swollen without, two of the stout terminal hairs removed towards the base..... *Culex discolor*.
Antennæ slightly swollen, narrowed at outer two thirds beyond the tuft, white basally..... *Culex aurifer*.
Antennæ with the tuft at the middle of the uniformly shaped joint..... 13.
13. Seventh abdominal segment with a large dorsal plate..... *Culex signifer*.
Seventh segment without a plate..... 14.
14. Comb of eighth segment of few spines in a single or partly double row..... 15.
Comb of many spines in three or more rows..... 29.

15. Anal segment ringed ; ventral tufts to the base ; tube inflated..... 16.
Without this combination of characters ; tube not inflated..... 19.
16. Antennæ long ; anal segment long and slender 17.
Antennæ moderate ; anal segment short, wider than long..... 18.
17. Comb of the eighth segment of six or seven subequal spines.
Janthinosoma musicum.
Comb of five spines, the upper and lower small..... *Janthinosoma varipes.*
18. Antennæ black on outer half ; the four spines of air tube scattered to basal half.
Grabhamia jamaicensis.
Antennæ all white ; the four spines of air tube restricted to basal third.
Teniorhynchus signipennis.
19. Anal segment not ringed ; usually with slight tufts before the barred area..... 20.
Anal segment ringed ; no tufts before the barred area..... 24.
20. Spines of the comb produced, elongate, blunt..... *Culex triseriatus.*
Spines not produced, short, thorn-shaped..... 21.
21. Tuft of tube within the pecten ; tube with dorsal tufts..... *Culex trichurus.**
Tuft of tube beyond the pecten, no other tufts..... 22.
22. Tuft of tube beyond the outer third ; anal processes pointed..... *Aedes fuscus.*
Tuft of tube before outer third ; anal processes blunt..... 23.
23. Anal plate longer than wide from side view, sharply incised subdorsally.
Culex impiger.
Anal plate wider than long ; no marginal incision..... *Culex sylvestris.*
24. Tube twice as long as wide or more ; comb of nearly simple spines..... 25.
Tube one and a half times as long as wide ; comb of spined teeth..... 28.
25. Comb of four to twelve teeth, large, thorn-shaped..... 26.
Comb a small patch of spines..... 35.
26. Anal processes long ; tube not functional ; larvæ aquatic..... *Culex dupreei.*
Anal processes normal ; tube functional..... 27.
27. Tuft of tube beyond the middle but within the pecten ; anal processes with apical half constricted..... *Culex serratus.*
Tuft of tube before the middle but beyond the pecten..... *Culex punctor. †*
28. Comb of digitately spined teeth in a small patch..... 36.
Comb of elongate teeth with central longer spine..... *Stegomyia fasciata.*
29. Pecten of the air tube a row of hairs outwardly..... 30.
Pecten of the air tube of toothed spines entirely..... 31.
30. Chitinized parts heavily infuscated, robust ... *Theobaldia incidens.*
Chitinized parts usually weakly infuscated, less robust.
Scales of comb about 60 ; air tube pecten with 1 or 2 teeth.
Culex consobrinus, Culex magnipennis.
Scales of comb about 40 ; pecten with 2 or 3 teeth..... *Culex absobrinus.*
31. Anal segment ringed by the plate..... 32.
Anal segment not completely ringed or with dorsal plate only..... 37.
32. Anal processes absent ; pecten of the air tube furcate..... *Deinocerites cancer.*
Anal processes present ; pecten of the air tube serrate..... 33.

* Synonym, *C. cinereoborealis* Felt & Young.

† Synonym, *C. abserratus* Felt & Young.

33. Brush of tube beyond the pecten..... 34.
Brush of tube within the pecten..... *Culex bimaculatus*.
34. Air tube over 2×1 , its pecten of 19-22 teeth..... 35.
Air tube 2×1 or less, its pecten of 12 to 14 teeth..... 36.
35. Scales of the comb with central apical spine shorter than the body of the scale;
pecten of air tube of equal teeth..... *Grabhamia sollicitans*.^{*}
Scales of the comb with central spine about as long as the body of the scale;
pecten of air tube longer outwardly..... *Culex trivittatus*.
36. Spines of comb digitately spined without central one *Culex taniorhynchus*.
Spines of comb feathered on sides with stout central thorn..... *Culex confirmatus*.
37. Anal processes moderate, not conspicuously tracheate..... 38.
Anal processes large, swollen, filled with branched tracheæ..... 48.
38. Anal processes moderate, normal..... 39.
Anal processes short, bud-shaped..... *Grabhamia curriei*.
39. Pecten of the air tube with detached teeth; tracheæ broad..... 40.
Pecten of the air tube without detached teeth..... 41.
40. Lateral hairs of the first abdominal segments double; detached teeth of comb
well spaced *Culex abfitchii*.†
Lateral hairs single; teeth only a little detached..... *Grabhamia vittata*.
41. Air tube long, slender, about 4×1 42.
Air tube short, stout, 3×1 or less..... 43.
42. Tube scarcely 4×1 ; tracheæ broad, not angled..... *Culex cantans*.
Tube over 4×1 ; tracheæ narrow, angled..... *Culex fitchii*.
43. Spines of comb thorn-shaped..... 44.
Spines of comb thick with feathered tips..... *Culex laaarensis*.
44. Anal segment almost completely ringed, tufts to base; tube 2×1 .
Culex æstivalis.
Anal segment distinctly not ringed; tufts scarcely to base; tube 3×1 45.
45. Brush moderate, tufts short-stemmed, chitin mostly brown..... 46.
Brush large, long stemmed, chitin mostly blackish..... *Culex pullatus*.
46. Head with black lunate spots..... *Culex cantator*.
Head without such spots..... 47.
47. Comb scales with apical spine longer but not stouter than the subapical ones.
Culex canadensis.
Comb scales with apical spine stout and distinct, fringed by the smaller ones.
Culex pretans.
48. Tuft of tube within the pecten; anal processes unspotted..... *Culex atropalpus*.
Tuft of tube beyond the pecten; anal processes spotted..... *Culex varipalpus*.
49. Antennal tuft at the middle of the joint..... *Culex resituans*.
Antennal tuft beyond the middle of the joint..... 50.
50. Anal segment with tufts before the barred area..... *Culex dyari*.

^{*} *G. sollicitans* and *C. trivittatus* are very difficult to separate. Compare Smith's figures, Ent. News, xv, pl. ix, 1904, and Bull. N. J. Agr. Exp. Sta., 171, pl. v, 1904. The former figure should be corrected by striking out the little tufts preceding the barred area on the anal segment in Fig. 6.

† Synonym, *C. siphonalis* Grossbeck.

- Anal segment without tufts before the barred area..... 51.
51. Comb of the eighth segment a row of bars..... 52.
Comb of the eighth segment a patch of spines..... 53.
52. Bars in one single uniform row; body glabrous.....*Melanoconion melanurus*.
Bars spine-like, in an irregular row; body pilose.....*Melanoconion atratus*.
53. Tube very long, concave, the tip a little wider.....*Culex territans*.
Tube long, but tapered to tip..... 54.
54. Antennæ not white banded; tube somewhat fusiform.....*Culex pipiens*.
Antennæ usually conspicuously white banded; tube tapered..... 55.
55. Tube longer, over four times as long as wide..... 56.
Tube shorter, four times as long as wide, not over.....*Culex tarsalis*.
56. Tufts of the tube scattered, fine, irregular.....*Culex salinarius*.
Tufts of tube along middle of posterior margin only, rather large...*Culex secutor*.

BRIEF NOTES ON MOSQUITO LARVÆ.

BY HARRISON G. DYAR, A.M., Ph.D.,

WASHINGTON, D. C.

CORRECTION OF THE ACCOUNT OF *CULEX CONSOBRINUS* DESV. — I described this larva from specimens sent by Messrs. Dupree and Morgan (Journ. N. Y. Ent. Soc., xi, 24, 1903), and expressed some doubt both there and at another time (Proc. Ent. Soc. Wash., vi, 39, note, 1904), whether the young larvæ were correctly associated. We have lately received from Dr. Dupree a full set of specimens of all stages, and it shows that the first ones were wrongly associated. There is no such remarkable change as those specimens indicated.

The eggs are laid in curved, boat-shaped masses, as in *pipiens*. The first-stage larvæ have the antennæ longer than the mouth brushes with a single hair at the middle; tube thick, about two and a half times as long as wide, with the outer half weakly infuscated, the pecten of four branched teeth with the usual tuft, composed of one hair, at about the middle of the pecten, very near the base of the tube. Anal segment with a dorsal plate and dorsal tuft of four hairs and one smaller side hair. Lateral comb of the eighth segment of five long, sharp spines. In stage ii the antennæ are as long as the mouth brushes only, with a tuft at the middle; the tuft of the air tube consists of two hairs, situated at the base of the posterior incision of the chitin, the pecten of seven branched teeth and two remote, longer, unbranched ones. The comb of the eighth segment is three rows

deep, the small spines with feathered tips. In stage iii the antennæ are the same; the tuft on the tube consists of several hairs, is situated as before, opposite the middle of the branched pecten, which is followed by several long, hair-like pectinations. Anal segment with a dorsal plate, several tufts before the barred area; comb teeth of the eighth segment with feathered tips. In the fourth stage the hair-like pecten on the air-tube is increased and elongated, while the anal segment becomes ringed by the plate. The antennæ are not changed.

IDENTITY OF *CULEX IMPIGER* WALK. — The form referred to by me under this name (Proc. Ent. Soc. Wash., vi, 37, 1904) has since been described as *pullatus*, while of the two forms referred to by Mr. Knab and myself (Proc. Ent. Soc. Wash., vi, 144, 1904), the first is *pullatus*, the second *trichurus*. This leaves the larva of *impiger* unknown; but I am glad to be able to adopt for it the one identified by Messrs. Felt and Young (Science, n. s., xx, 312, 1904), which Dr. Felt has kindly communicated to me. It closely resembles *sylvestris*, but differs therefrom in the longer anal segment, the chitinous plate of which appears longer than wide from side view and is deeply incised laterally.

LARVA OF *DEINOCERITES* CANCER THEOB. — We have received this larva from Kingston, Jamaica, through the kindness of Dr. M. Grabham. It has the general structure of *Culex*. The eyes are small but transverse, double; antennæ small, slender, uniform, with single hair tuft at the middle. Comb of the eighth segment a large patch of very small scales many rows deep, irregular in size and with divided tips. Air tube slender, four times as long as wide, a little tapered apically; two rows of pecten of few teeth, followed by a single hair on each side, the pecten teeth strongly furcate. Anal segment ringed by the plate, a dorsal patch and a small ventral one before the brush well chitinized, the sides nearly colorless. Anal processes absent, replaced by an annular cushion which is weakly divided into halves.

The larva is a very distinct one.

LARVA OF *HOWARDINA WALKERI* THEOB. — This larva also was communicated to us by Dr. Grabham, from Anchona, Jamaica, 5,000 feet altitude. It is extremely characteristic, being of the *Uranotania* form with the characters accentuated. All the hair tufts, except the lateral thoracic and those of the anal segment, are of the stellate form, composed of numerous short hairs. The head is smooth, rounded; antennæ short with hair at the middle. Abdominal segments, except in the intersegmental area, darkened by numerous small black spicules.

Comb of the eighth segment a single row of long sharp spines united by chitin at the base. Air tube about twice as long as wide, slightly tapered, the long spine-like pecten running from the base to the apex, enclosing a fine hair tuft at the outer third. Anal segment triangular, short on ventral line, about four fifths encircled by the plate which is fringed with long spines behind. Ventral brush with a small plate of chitin on each side of the barred area. Anal processes four, slender, filiform, tapering to a point, about as long as the anal segment, not tracheate.

LARVA OF GRABHAMIA CURRIEI COQ. — This was collected by Miss Isabel McCracken at Stanford, Cal. and by Mr. O. A. Johannsen at Ithaca, N. Y. It is of the ordinary short-tubed *Culex* type, yet rather characteristic by the extremely short anal processes, which are mere slight protuberances, shorter than in *sollicitans*. The head is dark brown, spotted with blackish much as in *cantator*; antennæ small with tuft at the middle; eyes large. Body hairs rather short, much as usual; abdominal tracheæ wide, band-shaped. Air tube two and a half times as long as wide, the pecten long, spine-like, evenly set, without detached teeth, branched at base, followed by a hair tuft a little beyond the middle of the tube. Comb of the eighth segment of about 25 scales in a multiple row the single scales broad and divided at tip. Anal segment with dorsal plate reaching half way down the sides, irregular on its termen. Ventral brush with a few hairs before the barred area.

NOTE ON CULEX CANTATOR COQ. — The larvæ occurred at Weekapaug, R. I., mixed with *sollicitans* in the temporary salt pools on the marshes and also in fresh water grassy marshes a little further from the sea. Professor Smith's figure of the larva (Bull. 171, N. J. Agr. Exp. Sta., pl. vii, 1904) brings out the main structural points, but is faulty in the representation of the anal segment, which is only about three fourths ringed by the plate, not completely so as there shown.

HIbernATION OF MELANOCONION MELANURUS COQ. — We were under the impression that this matter had gone on record, but such is evidently not the case, since Dr. Felt says recently (N. Y. State Mus., Bull. 79, 337, 1904) "the adult hibernating." This species is very peculiar in hibernating as the mature larva; we know of no parallel case. Mr. Brakeley has demonstrated the fact beautifully. The large larvæ in the pools in the late fall cannot be made to pupate but persist in hibernating. In the spring, however, after the ice is well melted they will pupate, though the larva is always deliberate about its trans-

formations. We believe that this species always hibernates as full grown larva and not in any other manner.

IDENTITY OF *CULEX ABFITCHII* FELT. — This is the form described as "*cantans* 1" by Mr. Knab and myself (Proc. Ent. Soc. Wash., vi, 143, 1904). What Dr. Felt calls *cantans* is a third form, figured as *cantans* by Dr. J. B. Smith and which we had not previously distinguished. It will be found defined in the preceding table. The comparison of European material is now more urgently needed than before.

LARVA OF *MELANOCONION ATRATUS* THEOB. — Mr. Theobald has published a photograph of this larva (Mon. Culic., III, pl. xvi, 1903), but the enlargement is insufficient to bring out any of the distinctive characters. I have received the species from New Orleans, from Dr. Dupree (through Dr. Howard). It belongs in the *territans* group and falls near *melanurus*, but the spines of the comb are in a less regular row than in that species, while the whole body is minutely pilose.

Class I, HEXAPODA.

Order IX, HEMIPTERA.

A LIST OF CERTAIN FAMILIES OF HEMIPTERA OCCURRING WITHIN SEVENTY MILES OF NEW YORK.

By J. R. DE LA TORRE BUENO,
NEW YORK, N. Y.

(Continued from Vol. XII, page 253.)

Family PENTATOMIDÆ.

In this family I follow the classification and nomenclature employed in the most recent American authoritative discussion of the group, "Annotated List of the Pentatomidæ Recorded from America North of Mexico," by Mr. E. P. Van Duzee. (Trans. Am. Ent. Soc., No. 1, Vol. xxx, 1904.)

Subfamily CORIMELÆNINÆ.

Genus CORIMELÆNA White.

C. unicolor de Beauvois (= *helopioides* Wolff = *atra* Amyot & Serville).

Jamesburg, N. J., August 5; Newfoundland, N. J., May and July; Staten Id., N. Y., June 12 and 23; West Hebron, N. Y., August; Van Cortlandt Pk., N. Y. September 19; Westfield, N. J., July 7.

This is apparently the most abundant species in this vicinity.

C. nitiduloides Wolff (= *histeroides* Say).

Newfoundland, N. J.

Only one specimen, taken by Mr. Davis. This would seem to be a rare form hereabout.

C. pulicaria Germar.

Mosholu, N. Y., July 8; Jamesburg, N. J., July 5; Lakehurst, N. J., July 12, Staten Id., N. Y., July 20; Westfield, N. J., July 16, 30, August 7.

This is a very common and widespread species, and appears on all lists. Mr. Davis' specimens were originally determined as *Corymelena lateralis*, and so appear in the New Jersey list; but this is a western form. The record for these specimens, therefore, is incorrect.

Subfamily SCUTELLERINÆ.

This subfamily is not represented in Prof. Smith's list.

Genus TETYRA Fabricius.

T. bipunctata Herrich-Schaeffer.

Lakehurst, N. J., April 25 (Davis) May 5 and 28.

This interesting form is found but not frequently at Lakehurst, and is ordinarily taken by beating the pines. It is of interest, as it is a southern insect, and Lakehurst, in the Pine Barrens, is in all probability its extreme northern range.

Genus AULACOSTETHUS Uhler.

A. marmoratus Say.

Lakehurst, N. J., April 30 and September 19 (Davis).

This is of infrequent occurrence.

Genus HOMÆMUS Dallas.

H. æneifrons Say.

Hamilton Co., N. Y. (Davis); Westfield, N. J., July 2.

This also is apparently quite rare.

Genus EURYGASTER Laporte.

E. alternatus Say.

Hewitt, N. J., August; West Hebron, N. J., June and September (Davis).

This seems to be more common and widespread than either of the preceding.

Subfamily GRAPHOSOMINÆ.

Genus PODOPS Laporte.

P. dubius de Beauvois.

New Jersey, March (Davis).

This specimen has in some degree the longer lateral pronotal processes mentioned by Van Duzee. It is the specimen the record of which Prof. Smith credits to Mr. Davis, and was determined by Dr. Ashmead.

P. cinctipes Say.

New Jersey, March 23, 1903.

These specimens were taken under stones by Mr. A. C. Weeks. This is the common form in this locality, if indeed, the other one be actually found here.

Subfamily CYDNINÆ.

Genus CYRTOMENUS Amyot & Serville.

C. mirabilis Perty.

Staten Id., August.

This is the specimen recorded in Prof. Smith's list, and was determined by Dr. Ashmead. According to Van Duzee, this bug is strictly southern.

Genus CYDNUS Fabricius (= *Microporus* Uhler).

C. (Microporus) obliquus Uhler.

Aqueduct, N. Y., September 19 (Davis).

According to Mr. Van Duzee, this insect is southwestern, but nevertheless, the specimen mentioned was taken by Mr. Davis in the Long Island locality named.

Genus PANGÆUS Stål.

P. bilineatus Say.

"N. J." (Davis), March 23.

As Mr. Davis' collecting is limited practically to the area selected, it is fair to assume that he found it within the prescribed limits. The specimen mentioned is the only one I have seen, and was determined by Dr. Ashmead.

Genus AMNESTUS Dallas.

A. spinifrons Say.

Staten Id., N. Y., May and June (Davis).

Recorded in Smith's list, and determined by Dr. Ashmead.

Genus SEHIRUS Amyot & Serville. (= *Canthophorus* Mulsant & Rey).

S. cinctus de Beauvois.

Hamilton Co., N. Y. (Davis).

Subfamily PENTATOMINÆ.

Some of the records, localities and dates in this subfamily are additional to my list of the Pentatomidæ, in Journ. N. Y. Ent. Soc., for December, 1903.

Genus BROCHYMENA Amyot & Serville.

B. arborea Say.

Staten Id., N. Y., August 31, June 11, September; Lakehurst, N. J., May 26, June, September 6.

Not uncommon at Lakehurst, from which locality I have seen a number of specimens, and has been taken occasionally in Staten Id. by Mr. Davis.

B. quadripustulata Fabricius.

Lakehurst, N. J., May 24 and September 4; Staten Id., N. Y., June 30, July 13, and September 10; W. Hebron, N. Y., June.

This has been taken by Mr. Davis on pine, according to the label on one of his specimens, and together with the preceding appears to be the most common form in this vicinity.

B. annulata Fabricius.

Lakehurst, N. J., June 26.

Found rather rarely at Lakehurst, where it is taken by beating the pines.

Genus PERIBALUS Mulsant & Rey.

P. limbolarius Stal.

Lakehurst, N. J., July 16 and September 6; Ramapo, N. Y., May 31; Staten Id., N. Y., May 11 and June 14; Van Cortlandt Park, N. Y., September 12, 1903.

Genus TRICHOPEPLA Stal.

T. semivittata Say.

Ft. Montgomery, N. Y., July 26; Little Falls, N. J., May; Staten Id., N. Y., June 8, August 16, September 26, October 3; Van Cortlandt Pk., N. Y., September 12; Mosholu, N. Y., October 3; Westfield, N. J., August 13, September 3.

This insect is abundant wherever found.

Genus PENTATOMA Olivier.

This genus is mentioned in Smith's List as *Lioderma* Uhler.

P. (*Lioderma*) saucia Say.

Staten Id., N. Y., April and September.

These captures are by Mr. Davis, who has found it now and then.

P. (*Rhytidolomia*) senilis Say.

Staten Id., N. Y., April, July, September and October.

This is locally the most abundant of the genus.

P. (*Chlorochroa*) uhleri Stal.

W. Hebron, N. Y., August.

This is one of Mr. Davis' interesting specimens and was taken by Mr. C. W. Leng. Mr. Van Duzee gives it (l. c.) as occurring in Colorado and the Rocky Mts. Possibly this is its extreme Eastern range.

Genus MORMIDEA Amyot & Serville.

M. lugens Fabricius.

Jamesburg, N. J., July 13; Perth Amboy, N. J., May 31; Ramapo, N. Y., May 31; Staten Id., N. Y., June and August; Westfield, N. J., July 2.

Very common and abundant in this vicinity, from early spring to late fall.

Genus **CEBALUS** Stal.**O. pugnax** Fabricius.

Anglesca, N. J., July 4 (Dr. E. G. Love).

Genus **EUSCHISTUS** Dallas.

This is by far the best represented and most abundant genus in the district under discussion.

E. fissilis Uhler.

Hewitt, N. J., July; Jamesburg, N. J., July 5 and August 31; Ramapo, N. Y., May 31; Staten Id., N. Y., May 31, June 11, September; W. Hebron, N. Y., August and September; Westfield, N. J., July 30, August 7 and September 3.

E. servus Say.

Jamesburg, N. J., July 5; Staten Id., June and September.

Rare. The identification is by Dr. Ashmead.

E. politus Uhler.

Jamesburg, August 31; Lakehurst, N. J., October 6.

A rather rare insect, apparently, taken by Mr. Davis in the localities mentioned. This appears in Dr. Smith's N. J. List as *Podisus politus*.

E. tristigmus Say.

Forest Pk., L. I., June 27; Ft. Montgomery, N. Y., July 26; Ramapo, N. Y., May 31; Staten Id., N. Y., June 12, October; W. Hebron, N. Y., August and September; Newfoundland, N. J., July and September; Mosholu, N. Y., June 6 and October 1; Westfield, N. J., July 4 and August 7.

This form is common in the grasses in moist or marshy meadows.

E. variolarius de Beauvois.

Jamesburg, N. J., June 22 and July 5; Lakehurst, N. J., June, July 12; Long Island, N. Y., July 29; Mosholu, N. Y., October 3; Newfoundland, N. J., May, Putnam Co., N. Y., September 5; Ramapo, N. Y., May 31, Staten Id., N. Y., June 12 and 26, July 20, August 2, October 10 and 23; W. Hebron, N. Y., August and September; Westfield, N. J., July 4 and August 7.

This species, together with *fissilis*, with which it may be confounded, and with *tristigmus*, are locally the most common and abundant species.

Genus **CÆNUS** Dallas.**C. delius** Say.

Staten Id., N. Y., June 14 and September 2; Singac, N. J., September 1; W. Hebron, N. Y., August and September; Mosholu, N. Y., October 1; Westfield, N. J., July 16 and 30.

Common in the area under discussion.

Genus **HYMENARCYS** Amyot & Serville.**H. nervosa** Say.

Staten Id., June 30 and August 2.

GENUS *MINEUS* Stal.

M. strigipes Herrich-Schaeffer.

Westfield, N. J., July 4.

Genus *COSMOPEPLA* Stal.

C. carnifex Fabricius.

Newfoundland, N. J., July 4; W. Hebron, N. Y., June, August and September.
This is a very common species.

Genus *MENECLIS* Stal.

M. insertus Say.

Sparta, N. J.

This is the specimen recorded by Professor Smith.

Genus *THYANTA* Stal.

T. custator Fabricius.

Brookville, N. J., July; Lakehurst, N. J., May 1, June 26, July 12, September 14, October 9.

This form is quite common in the pine barrens of New Jersey.

Genus *NEZARA* Amyot & Serville.

N. pennsylvanica DeGeer.

Jamesburg, N. J., June 22 and July 5; Staten Id., N. Y., February 11.

N. hilaris Say.

Deal, N. J., May; Jamesburg, N. J., August 31; Ft. Montgomery, N. Y., July 26; Staten Id., N. Y., June, July, August 31 and October.

The latter is the more common of the two species locally.

Genus *BANASA* Stal.

B. calva Say.

Lakehurst, N. J., September 26.

B. dimidiata Say.

Lakehurst, N. J., October 20.

Genus *LIOTROPIS* Uhler.

L. humeralis Uhler.

Lakehurst, N. J., September 6; Ft. Montgomery, N. Y., July 26.

This is apparently a rather common insect in this vicinity, as it was taken in fair numbers by Mr. Davis on the dates cited.

Subfamily *ASOPINÆ*.

Genus *STIRETRUS* Laporte.

S. anchorago Fabricius.

Jamesburg, N. J., July 4, 1890.

This is the only specimen I have ever seen from this locality, and is the one taken by Mr. Davis, which figures in Dr. Smith's N. J. list.

Genus *PODISUS* Herrich-Schaeffer.*P. cynicus* Say.

Brookville, N. J., July; Hewitt, N. J., July; Staten Id., N. Y., August.

I have never taken this, and from Mr. Davis' few specimens, would conclude it is not abundant locally. In general, also, these individuals are smaller than examples from the South in my collection.

P. maculiventris Say.

Jamesburg, N. J., July 5 and August 31; Ft. Montgomery, N. Y., July 26; Ramapo, N. Y., May 31; Staten Id., N. Y., March, June 12 and 27, August 2 October 26; W. Hebron, N. Y., August and September.

This is the most common member of the genus in this vicinity.

P. modestus Dallas.

Ft. Montgomery, N. Y., May 31.

This neat little species is apparently quite rare within my limits, the specimen noted being taken by Mr. Davis.

Subfamily ACANTHOSOMINÆ.

Genus *ACANTHOSOMA* Curtis.*A. lateralis* Say.

Staten Id., N. Y., April 19.

Rarely found. This specimen was taken by Mr. Davis.

Family COREIDÆ.

This important family is well represented in some of its species, which are very abundant in this district.

Genus *CHARIESTERUS* Laporte.*C. antennator* Fabricius.

Jamesburg, N. J., July 5; Lakehurst, N. J., July 29.

Apparently uncommon. I have taken none, and Mr. Davis but two, in some years' collecting.

Genus *CORYNOCORIS* Mayr.*C. typhæus* Fabricius.

Ft. Montgomery, N. J., July 27; Mosholu, N. Y., July 26; Staten Id., N. Y. June; Westfield, N. J., July 4 and September 3.

Genus *ARCHIMERUS* Burmeister.*A. calcarator* Fabricius.

Forest Pk., L. I., N. Y., June 27; Ft. Lee, N. J., August 8; Ft. Montgomery, N. Y., July 27; Mosholu, N. Y., May 29, June 13 and 22, July 25 and 26 October 4.

This is a very common form, and can be found in the adult practically through the year.

Genus **EUTHOCTA** Mayr.**E. galeator** Fabricius.

Mosholu, N. Y., September 6; Newfoundland, N. J., July; Staten Id., N. Y., June and September.

This is of rather infrequent occurrence.

Genus **METAPODIUS** Westwood.**M. terminalis** Dallas.

Mosholu, N. Y., September 6; Ramapo, N. Y., May 31; Staten Id., N. Y., May 7 and 8, June 20, September 8.

This also is rather uncommon. In two years' collecting I have secured but one immature adult.

Genus **LEPTOGLOSSUS** Guérin.**L. oppositus** Say.

Staten Id., N. Y., October.

This is the specimen credited to Mr. Davis in the N. J. List, and as it is the only one I have seen from this vicinity, it would seem to be quite rare.

Genus **ANASA** Amyot & Serville.**A. tristis** DeGeer

Jamesburg, N. J., June 22.

I have taken none of this species, and Mr. Davis only the one as above, possibly because neither of us frequents squash vines.

Genus **ALYDUS** Fabricius.

This is the most abundant genus of the family; both as to species and individuals. They are ordinarily to be found on bush-clover in the flowering season actively flying about. They make a rather loud noise with the wings, and in their flight resemble somewhat Hymenopterous insects. *Alydus calcarator* Fabr. (= *calcaratus* Uhl., not Linné), mentioned in the N. J. List, has been shown by Prof. A. L. Montandon ("Notes on American Hem. Het.," Proc. U. S. N. M., Vol. XVI, pp. 45-52, 1893) to be strictly European, and not to occur on this continent. The form identified with this he described as new under the name *Alydus conspersus* Mont.

A. eurinus Say.

Forest Pk., L. I., N. Y., June 27; Hewitt, N. J., July; Jamesburg, N. J., July 5 and August 31; Mosholu, N. Y., May 29, June 20, 22 and 28, July 25, August 8, October 18; Newfoundland, N. J., September; Staten Id., N. Y., June 12, August 2, September 6, 8 and 20; Van Cortlandt Pk., N. Y. City, August 15 and September 12; Westfield, N. J., August 7 and 13.

This is very common and abundant.

A. pilosulus Herrich-Schaeffer.

Forest Pk., L. I., N. Y., June 27; Brookville, N. J., July; Jamesburg, N. J., June; Mosholu, N. Y., June 22 and 28, July 19; Newfoundland, N. J., September; Van Cortlandt Pk., N. Y. City, June 6, August 15, September 12; Westfield, N. J., July 9 and September 5.

This form also is common, and occurs with the preceding in similar situations.

A. quinquespinosus Say.

Ft. Montgomery, N. Y., July 27; Hewitt, N. J., July; Jamesburg, N. J., August 31; Mosholu, N. Y., June 13 and 20, July 12 and 25, August 8 and 23; Palisades, N. J., August 22; Staten Id., N. Y., September 8 and 10, August 31.

This species is taken with the two preceding, but is not as abundant.

A. conspersus Montandon.

Newfoundland, N. J., September, 1899.

I have seen only this one specimen, determined by me, in the collection of Mr. Davis, and have taken none myself.

Genus **HARMOSTES** Burmeister.

H. reflexulus Stal.

Cold Spring Harbor, N. Y., July 28; Ft. Montgomery, N. Y., July 26; Ramapo, N. Y., May 31; Lakehurst, N. J., September 5; Mosholu, N. Y., August 4, 7, 9 and 15, September 13; Westfield, N. J., July 9 and August 13.

This is quite common.

Genus **CORIZUS** Fallen.

C. lateralis Say.

Jamesburg, N. J., July 5; Lakehurst, N. J., May 26 and July 12; Newfoundland, N. J., May; Mosholu, N. Y., July 26 and August 8; Van Cortlandt Pk., N. Y. City; September 1 and 13.

This is another common form.

Family **BERYTIDÆ**.

Genus **NEIDES** Latreille.

N. muticus Say.

Ft. Montgomery, N. Y., July 26.

Genus **JALYSUS** Stal.

J. spinosus Say.

New York City, October 21; Westfield, N. J., July 2.

The first specimen is of interest, because it was captured in the window of one of the tall Broadway buildings, about 120 feet above the street.

Family **PYRRHOCORIDÆ**.

Genus **LARGUS** Hahn.

L. succinctus Linnæus.

Lakehurst, N. Y., May 25 and September 19. (Davis.)

This Hemipteron is very common in Lakehurst from May to September or later.

Family **ARADIDÆ**.

In this family I have not yet succeeded in collecting many specimens personally, and for the local material in my collection, I am indebted to the kindness of Mr.

Davis, who has generously filled gaps in my series, and therefore, most records belong to him. All the insects in this family from which the records credited by Prof. Smith to Mr. Davis have been made, have passed under my eyes, and I make the comments necessary in their proper place.

Genus ARADUS Fabricius.

A. æqualis Say.

W. Hebron, N. Y., June.

A. robustus Uhler.

Ft. Montgomery, N. Y., May 31.

A. similis Say.

Staten Id., N. Y., April 4.

A. acutus Say.

Lakehurst, N. J., April 15.

The two last named species, Prof. Smith has put in his list on the authority of Prof. Uhler's Check List, and as far as known to me, these are the first actual records of captures from the region treated of by Dr. Smith.

A. cinnamomeus Panzer.

Lakehurst, N. J., May 1 and 27; Staten Id., N. Y., April 10. (This is the specimen named in Smith's List.)

This form is very abundant in Lakehurst, on the pines, where Mr. Davis and I have taken it by beating, at different times. It occurs in three forms, wingless, with partly developed wings, and I have met with one fully winged individual.

A. niger Stal.

Lakehurst, April 14.

This is another of Mr. Davis' fortunate captures, as it is a rather rare insect. This is an addition to the New Jersey list.

A. lugubris Fallen.

Staten Id.

This is the specimen recorded by Dr. Smith in his list. In his enumeration he gives this species twice, the other record being under the synonym *A. rectus* Say.

A. sp.

Staten Id., April 10.

This is the species given in the N. J. list as *A. robustus* Uhl., which it certainly is not, as it does not agree with Uhler's original description.

Genus NEUROCTENUS Stal.

N. simplex Uhler.

Jamesburg, N. J., June 22; Lakehurst, N. J., July 12 and 19; Westfield, N. J., June 19 and September 4.

This species is recorded twice by Dr. Smith, the other time under the genus *Brachyrhynchus*, under which Uhler originally described it.

Genus *ANEURUS* Curtis.

A. politus Say.

Staten Id., June 26.

A. septentrionalis Walker.

Perth Amboy, N. J., May 31; Staten Id., May 12; Westfield, N. J., August 14 and September 4.

This species and the preceding are new records from the area under discussion. The latter species appeared in the New Jersey list as *Brachyrhynchus simplex* Uhl.

Family PHYMATIDÆ.

Genus *PHYMATA* Latreille.

P. erosa Linnaeus (= *P. wolffii* Stal).

Lakehurst, N. J., July 29 and August 12; Singac, N. J., September; Staten Id., N. Y., April 9, August 2, 8 and 31, September 26, October 3 and 5; W. Hebron, N. Y., August; Westfield, N. J., July 30 and August 21.

P. sp.

Ramapo, N. Y., May 16.

One specimen only. This is a small species, about 6 mm. long, and entirely unlike the preceding in the shape of pronotum and dilated abdomen. In the absence of Dr. Handlirsch's monograph, I do not care to pronounce positively on its specific position.

Family HYDROMETRIDÆ.

Genus *HYDROMETRA* Latreille (= *Limnobates* Burmeister).

H. martini Kirkaldy (= *H. lineata* Say).

Staten Id., May 7 and 16, April 11 (Davis), September 26; Van Cortlandt Pk., N. Y. City, April 11 and July 4; Westfield, N. J., June 19, July 3 and 9, September 11; Rahway R., Cranford, N. J., August 27.

American entomologists, following Burmeister and Stal, have always called this genus *Limnobates* and the family *Limnobatidae*. Dr. Burmeister's facility for changing names has given rise to great confusion in this respect, since the more recent European specialists (Montandon, Horvath, Kirkaldy, Puton, et al.) have correctly appreciated the synonymy, and have shown that Latreille founded the genus on *Hydrometra stagnorum* Linné, and that the family is therefore Hydrometridæ, and the genus *Hydrometra*. I do not follow them in putting in the Gerridæ and Veliidæ with it, for reasons not necessary to go into in detail, and consider these as separate families. The specific name, as Kirkaldy points out* cannot stand, as it is preoccupied by *H. lineata* Eschsch., from Manila, so he has changed it to *martini*.

H. martini is of retiring habits. In Staten Id., at the same pond, or rather, marsh, Mr. Davis and I have found it in numbers. We have taken together at least 150 specimens and let as many more escape. The females seem to be the more abundant in numbers. In all these, we have met with but two winged individuals,

* The Entomologist, June, 1900, p. 176.

both male; all the others being completely apterous. One specimen was taken by Mr. Davis in a plowed field, some distance from water. This Hemipteron overwinters in the adult form and begins oviposition early in May. How late it may continue, I am unable to say, as I have two females in an aquarium at this writing (July 15), and they are still ovipositing. The females recently arrived at the adult stage, which they do some time in early July from the spring ova, also oviposit at this time of year, so that it is quite possible that they are double brooded, the more so that the entire period of development from the ovum to the adult appears to take but little over six weeks, the moults being very rapid. I feed them flies—a staple breakfast food, with insects I rear—to which they take kindly, fastening their long rostra into the insect even before it ceases to struggle. It seems immaterial, however, that their prey should be fresh, as they appear to feed on dead insects as much as two or three days old. They run on the surface of the water with considerable swiftness, exactly as if they were on a solid surface.

Family GERRIDÆ.

In this family, nearly all of Stål's different genera become subgenera, according to Kirkaldy, who writes me that they are connected by intermediate forms, and in deference to his exhaustive knowledge of the subject, I so consider them in the following, regarding them as subgenera of the genus *Gerris*.

Genus GERRIS Latreille.

G. (*Hygrotrechus* Stal) *remigis* Say.

Lakehurst, N. J., May 30; Central Park, N. Y. City, April 11; Mosholu, N. Y., May 4 and October 1; Putnam Co., N. Y., September 5; Staten Id., N. Y., March 29; Van Cortlandt Pk., N. Y. City, July 4; Rahway R., Cranford, N. J., August 6 and 20; Westfield, N. J., July 4 and 16, August 11.

This is very abundant in running and sometimes on still waters, from early spring, as soon as the ice melts, till late fall. Winged individuals are rather rare.

G. (*Hygrotrechus*) *conformis* Uhler.

Putnam Co., N. Y., September 5; Rahway R., Cranford, N. J., August 6.

I have taken only the two specimens recorded, both winged individuals.

G. (*Limnotrechus* Stal) *marginatus* Say.

Bronx, N. Y. City, September 30; Central Park, N. Y. City, March 22; Ft. Lee Dist., N. J., July 4 and 18, October 10; Lakehurst, N. J., May 23, 25 and 30; Staten Id., N. Y., March 29, May 7, August 16; Putnam Co., N. Y., September 5; Van Cortlandt Pk., N. Y. City, April 18 and 15, June 6, September 19; October 1; Rahway R., Cranford, N. J., August 8.

This is very common on still waters. I have found it especially abundant at Van Cortlandt in the early spring, on the lake, where it keeps close to the shore. It occurs in three forms, but I have rarely taken the wingless, the fully winged being the most common.

G. (*Limnotrechus*) *sulcatus* Uhler.

Van Cortlandt Pk., N. Y., October 1.

One specimen only taken.

G. (*Limnotrechus*) *canaliculatus* Say.

Central Park, N. Y. City, March 22; Palisades, N. J., April 19; Putnam Co., N. Y., September 5; Staten Id., N. Y., May 7; Van Cortlandt Pk., N. Y. City, March 28, April 25 and October 1; Westfield, N. J., June 20, August 13, September 9; Rahway R., Cranford, N. J., August 6 and 20.

This differs from the preceding in its greater slenderness and longer and more slender antennæ and legs. It is quite rare and is found in the three forms. However, at Echo Lake I took quite a number in a little dark cove full of drift and twigs, among which they were hiding. The two last-named species are additional to the N. J. List.

G. (*Limnoporus* Stal.) *rufoscutellatus* Latreille.

Ft. Lee Dist., N. Y., April 19, May 9, July 18, August 9, September 7, October 10; Putnam Co., N. Y., September 5; Van Cortlandt Pk., N. Y. City, June 6; Westfield, N. J., July 4.

This abounds on the surface of the rock pools in the Palisades, where I have found it only in the macropterous form.

Genus *TREPOBATES* Uhler (= *Stephania* B. White).***T. pictus* Herrich-Schaeffer.**

Lakehurst, N. J., October 18 (Davis); Lake Mahopac, N. Y., September 5; Echo Lake, Westfield, N. J., September 2.

The specimen from Lake Mahopac was taken among a great number of *Metrobates hesperius* Uhl. At Echo Lake, however, it occurred in swarms, in several stages, near the water's edge, in company with *Rheumatobates rileyi*. Not heretofore recorded from New Jersey.

Genus *RHEUMATOBATES* Bergroth.

This odd and interesting genus, in which the males are distinguished by their peculiarly formed prehensile antennæ, was discovered a number of years ago by Dr. J. L. Zabriskie, in Long Island. It has not since, I believe, been recorded from this vicinity.

***R. rileyi* Bergroth.**

Echo Lake, Westfield, N. J., September 2; Rahway R., Cranford, N. J., August 6, 20 and 27.

This little bug is extraordinarily abundant in both localities, more especially on the still waters of Echo Lake. On the river, it hugs the shores, and seeks the quiet waters of little coves. It was taken in several stages at both localities. Only one winged specimen was found, a male *in cop.*, out of hundreds taken.

Genus *METROBATES* Uhler.***M. hesperius* Uhler.**

Lake Mahopac, N. Y., September 5.

This insect is exceedingly abundant on the lake, where myriads congregate, forming large black patches on the water near the shores.

Family VELIIDÆ.

Genus MICROVELIA Westwood.

M. americana Uhler (= *Hebrus americanus* Uhler).

Central Park, N. Y. City, March 22; Ft. Lee Dist., N. J., May 28 and September 7; Bronx, N. Y. City, September 30; Staten Id., N. Y., March 29; Rahway R., Cranford, N. J., August 6 and 20; Westfield, N. J., July 4, 16, 30, August 13, September 2.

I have placed this insect here, as it is evidently a *Microvelia* and not a true *Hebrus*. The generic characters do not agree with those given for the latter genus by Amyot & Serville. The Hemipteron is extraordinarily abundant under the banks of a little stream near Leonia, and this spring I found it on another little stream at Fort Lee. It appears to prefer running water. Out of a long series I obtained only one fully winged individual. In the N. J. List, Prof. Smith gives it from "Atlantic States" fide Uhler. In another little stream in Westfield, in a little bayed-in place and under the overhanging banks, took several more winged individuals. They were abundant in all the places cited, and rest usually on the shore or on floating logs at the water's edge, onto which they run on being alarmed, returning immediately to the shore.

M. pulchella Westwood.

Staten Id., May 5 and August 16. Ft. Lee, N. Y., July 18.

I have taken but few specimens of this form, two of those taken this spring on Staten Id. being winged individuals. This species is lacustrine, and to be found running on *Lemna*.

I have also taken what are apparently three other species of the genus, one near *M. americana* Uhl., and the other two near *M. pulchella* Westw., but have not been able to determine them, due to absence of literature.

Genus MESOVELIA Mulsant.

M. mulsanti White (= *M. bisignata* Uhler).*

Ft. Lee Dist., N. J., August 20 and 22, September 7 and 18; Putnam Co., N. Y., September 5; Staten Id., N. Y., August 16 and September 26; Van Cortlandt Pk., N. Y. City, August 15, September 19 and October 1; Westfield, N. J., June 26, July 3 and 9, September 2; Rahway R., Cranford, N. J., August 6 and 27.

This is very abundant on *Lemna*, in still waters. I have taken it in the three forms, fully winged, brachipterous, and apterous, the last being the most abundant. This is a most widespread bug. It is recorded from the greater part of the continent, the Antilles, and as far down as the Amazon River. In the Rahway River at Cranford and in general in that district, the winged form is much more abundant than I have seen it elsewhere.

Genus RHAGOVELIA Mayr.

R. obesa Uhler.

Lakehurst, N. J., July 11, September 5 and October 18; Rahway R., Cranford, N. J., August 6, 20 and 27.

*Champion, Biol. C. A., Rhynchota, Hem. Het., II, p. 123.

It is abundant in Lakehurst, where Mr. Davis took it. Very abundant in riffles and rapid portions of the current on the Rahway R., where it can be seen swimming against the stream in zigzags. Winged individuals were far from uncommon and generally congregated in the slackwater behind rocks projecting above the surface. I took them principally in these situations.

Family GELASTODORIDÆ.

(= *Galgulidæ olim.*)

A few words in explanation of this change are not amiss. The old familiar "*Galgulus*" Latr. has for many years been preoccupied in *Aves*, and since under the rule of priority it cannot be used, Kirkaldy has proposed the name *Gelastocoris* for the typical genus, thus changing the family name as well. This change has been adopted by authorities, notably by Champion in *Biologia Centrali-Americana*.

Genus PELOGONUS Latreille.

P. americanus Uhler.

Staten Id. (Davis), Mosholu, N. Y., May 29; Westfield, N. J., July 4 and 7.

I have seen few specimens of this interesting little species, which links the Saldidæ on the one hand with the Galgulidæ on the other. The specimen from Staten Island is the one recorded in Dr. Smith's List.

Genus GELASTOCORIS Kirkaldy (= *Galgulus* Latr., preocc.*)

G. oculatus Fabricius.

Staten Id. (Davis). I have not seen this insect in this vicinity, and the only specimen I am acquainted with from our region is the one in Mr. Davis' collection, which is also the one recorded by Prof. Smith.

Family NAUCORIDÆ.

Genus PELOCORIS Stal.

P. femoratus de Beauvois.

Delair, N. J.; Staten Id., N. Y., May 7 and 16, September 26, October 25; Van Cortlandt Pk., N. Y. City, March 11 and 13, May 2, June 6, July 27; Rahway R., Cranford, N. J., August 27.

This is a widespread species, ranging from Massachusetts down through Mexico and into South America. It is abundant wherever present.

Family BELOSTOMIDÆ.

In the "Bulletin de la Société des Sciences," of Bucarest, Rumania, year IX, nos. 2 and 3, Prof. Montandon clears up the generic synonymy of this family, and shows that the type of *Belostoma* Latr. is a *Zaittha* auctt., and therefore drops the latter generic name for the prior one, whence *Zaittha* is now known as *Belostoma*; the old *Belostoma* not standing, he has proposed the name of Stal's subgenus *Amorgius* in its place. I have here accepted his conclusions and employ his nomenclature.

* Kirkaldy, The Entomologist, 1897, p. 258.

Genus *BELOSTOMA* Latreille (= *Zaitha* auct.).*B. flumineum* Say.

Bronx, N. Y. City, September 9; Forest Pk., L. I., N. Y., November 7; Palisades, N. J., August 20 and 22, September 7; Staten Id., N. Y., August 16, September 8 and 26, October 24 and 25; Van Cortlandt Pk., N. Y. City, March 25; Rahway R., Cranford, N. J., August 6 and 20.

This is by far the most abundant member of the family, or at least, the most easily taken. It can be found in almost any muddy pond with abundant vegetation.

B. testaceum Leidy.

Delair, N. J. This is additional to the N. J. List, and was sent to me by Mr. W. P. Seal among a lot of aquatics he very kindly favored me with:

B. sp.

Delair, N. J. Van Cortlandt Pk., N. Y. City, March 28. This form I have found now and then, and have taken about three or four specimens all told. It is smaller and rounder than either of the two preceding, and I cannot satisfactorily identify it.

Genus *AMORGIUS* Stal (= *Belostoma* auct.).*A. americanum* Leidy.

Ft. Lee, N. J., April and September 18.

A. obscurum Dufour.

Ft. Lee, N. J., April and September 18. Mt. Vernon, N. Y., June 4.

This name has been reduced to synonymy, and so appears in Prof. Uhler's "Check List." Prof. Montandon, however, rehabilitates it and shows that it represents undeniably a good species.* This and the preceding I have taken in the last nymphal stage and allowed to come to maturity in my aquaria. This is the only way I have been able to get them, and except at electric lights, I doubt that it is easy to capture swift swimmers. The nymphs of both species differ from the adults, in addition to the lack of wings and general undeveloped condition, in having the anterior tarsi biungulate.

Genus *BENACUS* Stal.*B. griseus* Say.

New York City, July 22.

This is the only specimen I have taken of this insect. I found it flapping its wings under an electric light. Mr. Davis, however, has a good series from Staten Id. It appears to be much more abundant than *Amorgius*.

Family *NEPIDÆ*.Genus *NEPA* Fabricius.*N. apiculata* Uhler.

Staten Id., N. Y. (Davis). Mt. Vernon, N. Y.; Westfield, N. J., July 16 and August 13.

* "Hem. Het. Exotiques, Notes et Descr., II, Fam. Belostomidae," Ann. Soc. Ent. Belg. t., XL, pp. 508-520, 1896.

Although I have diligently sought this insect, I have not yet succeeded in taking the adult. I have seen only two specimens, the ones recorded above. This would appear to be very rare hereabout.

Genus *RANATRA* Fabricius.

R. fusca de Beauvois.

Central Park, New York City. This is commonly given in the text-books as the common species in the East. I have, however, taken only the one specimen recorded, and have seen no others from this vicinity.

R. quadridentata Stal.

Central Park, New York City, March 12; Forest Pk., L. I., November 7; Ft. Lee, N. J., August 20 and 22, September 7 and 18; Putnam Co., N. Y., September 5; Van Cortlandt Pk., N. Y. City, March 25; Rahway R., Cranford, N. J., August 27.

This form is by far the most abundant locally, as it seems to be throughout the United States, to judge from material received from many quarters.

R. kirkaldyi Bueno. (Ms.).

Putnam Co., N. Y., September 5.

This is a very small species, with shorter air-tubes in proportion to the body than either of the preceding. It will be described by me in a paper in preparation. I have taken only one specimen of this, but have a large series sent in by a collector.

Family NOTONECTIDÆ.

Genus *NOTONECTA* Linnæus

N. undulata Say.

Central Park, New York City, April 30 and March 11 and 12; Delair, N. J., September 1; Bronx, New York City, September 9; Forest Park, R. I., November 7; Palisades, N. J., March 2 and 7, April 19, May 1 and 9, July 18, August 9, September 7 and October 10; Putnam Co., N. Y., September 5; Staten Id., N. Y., August 16, September 26 and October 25; Rahway R., Cranford, N. J., August 6 and 27; Ft. Lee Dist., N. J., September 18.

This is by far the most abundant form throughout the United States and locally. It occurs in common with the other species of the genus, from the time the ice melts in spring until the late autumn.

N. variabilis Fieber.

Central Park, New York City, April 12; Delair, N. J., Lakehurst, N. J., May 23 and 26; Palisades, N. J., March 7, May 9, July 18, August 22, September 7; Putnam Co., N. Y., September 5; Staten Id., N. Y., May 7 and 16, August 16, September 26; Van Cortlandt Park, New York City, March 28, April 11, 18 and 25, June 6, July 4 and 25, August 8, November 4, and October 1; Rahway R., Cranford, N. J., August 20 and 27; Westfield, N. J., July 4, 9 and 16; Fort Lee Dist., N. J., September 18.

This is a good species, although Prof. Uhler has long been of the opinion that it is conspecific with the preceding species. It also is very abundant where found. It

is practically the only species to be taken at Van Cortlandt. Very rarely single specimens are found in company with *Notonecta undulata*, and this is also true of the occurrence of the latter with the former. It is this insect that is recorded in Dr. Smith's list as *N. americana*, a bug that occurs only in the southern part of the country. *N. variabilis* is omitted in the list mentioned.

N. uhleri Kirkaldy.

Palisades, N. J., May 5; Putnam Co., N. Y., September 5; Van Cortlandt Park, New York City, April 11, 18 and 25; Fort Lee Dist., N. J., May 14.

This extremely beautiful crimson and black species, mentioned in my first notes on this family * as likely to occur in this vicinity, I myself had the pleasure of finding at Van Cortlandt Park, making the first published record of the species in this State, and indeed, the first mention of it outside of the type localities. My catch in the localities mentioned constitutes the majority of the specimens in collections. This is a very rare bug, but very readily separable from any other American species.

N. irrorata Uhler.

Delair, N. J., Bronx, New York City, September 30; Forest Park, R. I., November 7; Palisades, N. J., July 18, August 9 and 23, September 7 and 23, October 10; Putnam Co., N. Y., September 5; Staten Id., N. Y., August 2 and October 2; Van Cortlandt Park, New York City, April 11, 18 and 25, June 6 and July 25; Rahway R., Cranford, N. J., August 6, 20 and 27; Fort Lee Dist., N. J., September 18 and October 22.

This bug is not uncommon in dark waters, hiding among stems and roots growing in the water.

N. insulata Kirby.

Delair, N. J.; Palisades, N. J., May 1, August 9 and 23; Staten Id., N. Y., September 26.

This species is not very abundant. It may at times be found in company with *N. irrorata*, but ordinarily it seems to seek clear cold pools, where the water is deep

Genus ANISOPS Spinola.

A. elegans Fieber.

Palisades, N. J., September 7; Staten Id., September 26; Van Cortlandt Park, New York City, July 25; Rahway R., Cranford, N. J., August 27; Fort Lee Dist., N. J., September 18 and October 22.

This is rather rare in this vicinity and may be found floating in the shallower waters of ponds, near the edges, among the weeds.

A. sp. (? albidus Champion).

Delair, N. J.; Staten Island, N. Y., September 8 and 26, October 25, November 11.

This is the species erroneously identified by me as *Anisops platynemis* in my paper cited above. At the time this identification was made, I did not possess Fieber's

* "Notonectidae of the Vicinity of New York," Journ. N. Y. Ent. Soc., Vol. X, no. 4, December, 1902.

"Rhynchographien," where the species in question is described. *Anisops platynemis* is small, about 5 mm. long, while this bug is 7 to 8 mm., and, according to Fieber's description, approaches the preceding. This species is the most abundant in this vicinity.

Genus *PLEA* Leach.

P. striola Fieber.

Staten Id., N. Y., May 7 and 16, and September 26; Van Cortlandt Park, New York City, April 11, 18 and 25, September 13 and 19; Rahway R., Cranford, N. J., August 27; Westfield, N. J., July 16 and August 13.

This small bug is abundant from early spring until late fall, hiding among the fine-leaved aquatic plants and algae, where it swims about in quest of its food, crawling on the stems and among the matted fibers. As far as I have been able to observe, this Hemipteron is a vegetable feeder.

In conclusion, for the information of those of my readers who have not collected about New York, I will give a few notes on the localities. Central Park, of course, is the well-known pleasure ground of New York City, right in the heart of it. There is a little lake at about 100th street and the west side of the Park, where I have taken most of the aquatics for which this locality is given. Van Cortlandt Park is also in the city, toward Yonkers, on the line of the N. Y. and Putnam R. R. It is far more wild than Central Park, and in the lake there I have made very good catches. This was drained this year, unfortunately, to make some "improvements" and the insects are gone. Land bugs I have taken along the edges of the lake, in the bushes and grasses growing between it and the railroad tracks, and also in a sandy spot between the tracks at a fork of the railroad. Moshulu is about a couple of miles north of Van Cortlandt Park, and in fact, the collecting grounds form a part of this park. The localities where collecting is done by the New Yorkers are a meadow about a quarter of a mile west of the station and the woods on the hillside and those through which a little stream runs on the other side. Staten Id., means the entire island, in its ponds and woods and fields. Palisades, N. J., stands for the region around Fort Lee, Grantwood, Edgemere, and the other small towns that are springing up, including also Leonia. Bronx is the northern part of New York City, which is still more or less of a wilderness, but rapidly building up.

A LIST OF CAPSIDS FROM THE STATE OF NEW YORK, WITH THE DESCRIPTION OF A NEW SPECIES.

BY OTTO HEIDEMANN,

WASHINGTON, D. C.

- Miris instabilis* Uhl. — Mosholu.
Collaria oculatus Reut. — Mosholu.
Collaria meilleurii Prov. — Mosholu.
Phytocoris puella Reut. — Staten Id., Mosholu.
Neurocolpus nubilus Say — Ft. Lee, Mosholu, Palisades.
Lopidea media Say — Ft. Lee, Mosholu.
Stenotus binotatus Fabr. — Mosholu.
Calocoris rapidus Say — Mosholu, Forest P.
Calocoris bipunctatus Fabr. — Mosholu.
Lygus invitus Say — Mosholu, Forest P.
Lygus pratensis Linn. — Cortlandt, Staten Id., Mosholu.
Lygus pratensis Linn., large var. — Mosholu.
Lygus flavonotatus Prov. — Mosholu, Palisades.
Lygus pabulinus Linn. — Staten Id., Mosholu.
Lygus monachus Uhl. — Mosholu, Lakehurst.
Pæciloscytus basalis Reut. — Mosholu, Lakehurst.
Pæciloscytus sericeus Uhl. — Mosholu, Forest P.
Pæcilocapsus lineatus Fabr. — Mosholu, Cortlandt.
Pæcilocapsus goniphorus Say. — Mosholu.
Pæcilocapsus, black var., Reut. — Mosholu, Lakehurst.
Deræocoris segusinus Muell. (Reut.) var. *capilaris* Fabr. — Brooklyn, June 27, 1903.

Several specimens found, males and females, showing all the varying shades of black, red and orange, peculiar to this species. They agree exactly with the European specimens with which I compared them. This species is rarely seen in collections. Prof. Uhler has listed it in his Check-List of Hemiptera, and it is also recorded by Reuter as occurring in North America.

- Systratiotus americanus* Reut. — Mosholu, Forest P.
Capsus ater Linn. — Cortlandt.
Monalocoris filicis Linn. — Staten Id., Sandy Hook.
Pycnoderes insignis Reut. — Staten Id.
Campptobrochis nebulosus Uhl. — Mosholu, Ft. Lee.

- Hyaliodes vitripennis* Say. — Mosholu, Staten Id.
Dichrooscytus elegans Uhl. — Mosholu, Lakehurst.
Orthops scutellatus Uhl. — Mosholu.
Diommatus congrex Uhl. — Staten Id.
Dicyphus californicus Stal. — Staten Id.
Halticus uhleri Girard. — Staten Id.
Stiphrosoma stygica Say. — Mosholu, Forest P.
Onychumenus decolor Fall. — Mosholu.
Episcopus ornatus Reut. — Mosholu.
Psallus juniperi, new species.

Body elongate-oval, densely covered with fine golden hairs, interspersed with darker, erect, longer ones. Color pale-yellowish, slightly sprinkled with reddish. Head nearly vertical, short; broader across the eyes, which are prominent and reniform, touching the anterior border of pronotum. Face slightly rounded, broad, marked with four transverse, brownish lines, interrupted in the middle. These lines are sometimes indistinct, being covered by hairs. Antennæ nearly reaching the tip of cuneus; the joints equally stout, except the basal one, which is a trifle thicker, also shorter than the head and extending beyond the tip of head; second joint nearly four times longer than the first; the third two-thirds as long as the second, and the terminal joint somewhat longer than the first. Rostrum yellowish, reaching to the posterior coxæ. Pronotum trapezoidal, slightly convex, strongly declivous in front; anterior margin half the width of the posterior margin and a little sinuate in the middle; lateral margins not sharply marginate, somewhat depressed; the humeri subacute, rounded behind; the callosities very feebly indicated. Scutellum quite small, as long as wide. The sides of the hemelytra almost straight; clavus tinged with a reddish hue, which color extends in some bright specimens along the suture to the inner part of the corium; cuneus triangular, speckled with red, at tip whitish. The scutellum has near each basal angle a brownish spot, composed of tufts of hair. A linear spot at the apex of the clavus, and two minute spots along the posterior margins of the corium. Membrane fuscous and iridescent, considerably surpassing the abdomen; the veins of the cells white; close to the apex of the cuneus runs a short, hyaline line, exteriorly. Abdomen greenish-white, polished. Legs yellowish-white; the femora more or less mottled with red, the hind femora broad, compressed, and the hind tibiæ comparatively long, beset with fine white hairs and with dark, remote, long bristles. Claws very strong and blackish. Length to the tip of membrane 2.75 mm. Width across the hemelytra 1 mm.

Mosholu, N. Y., July 20, 1902 (de la Torre Bueno), 3 specimens, Crescent City, Fla. (E. A. Schwarz), Marshal Hall, Md., June 6, 1891, Front Royal, Va., August 6, 1893; Washington, D. C., June 9, 1891 (Heidemann).

Type. — No. 8199, U. S. National Museum.

This species is a small and a very frail insect, occurring during the summer months on red cedar (*Juniperus virginiana*).* It has pro-

* Proceedings of Ent. Soc., Washington, D. C., Vol. II., p. 225, 1892.

ably two broods, and hibernates in the adult state. This delicate Capsid may easily be recognized by its ornamentation of brown spots on the scutellum and hemelytra.

Agalliastes associatus Uhl. — Mosholu, Cortlandt.

Agalliastes suavis Reut. — Mosholu.

Plagiognathus obscurus Uhl. — Mosholu, Staten Id.

Plagiognathus annulatus Uhl. — Mosholu.

Plagiognathus fraterculus Uhl. — Mosholu, Forest P.

Plagiognathus politus Uhl. — Cortlandt, Mosholu.

Class I, HEXAPODA,

Order XI, ORTHOPTERA.

A NEW SPECIES OF THE LOCUSTID GENUS AMBLYCORYPHA FROM KANSAS.

By A. N. CAUDELL,

WASHINGTON, D. C.

Amblycorypha iselyi, new species.

In size comparable with *A. rotundifolia* but differing from that species in having the elytra more rotundate and the wings aborted, not reaching the tips of the elytra, in this respect allied to the larger *parvipennis* of Stål. Ovipositor of about the same length and shape as that of *rotundifolia* but a little stouter. Pronotum flat above, the lateral carinae sharp and persistent. Hind femora extending considerably beyond the tips of the elytra in both sexes.

Length of pronotum, male, 7.5 mm., female, 8 mm.; elytra, male, 22.5 mm., female, 25 mm.; hind femora, male, 25 mm., female, 26 mm.; of hind femora beyond the tips of the elytra, male, 6.5 mm., female, 7 mm.; ovipositor, female, 10 mm.; width of elytra, male, 9 mm., female, 9 mm.; of pronotum, in front, male, 3.25 mm., female, 3.5 mm.; behind, male, 4.75 mm., female, 5 mm.

Type. — No. 8197, U. S. National Museum.

Described from two pairs taken at Wichita, Kansas, by Professor Isely in July, 1904.

JOURNAL
OF THE
New York Entomological Society.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

EDITORIAL.

Within the last two years very rapid strides have been made in the knowledge of the North American mosquitoes both as adults and larvæ. Especially from the study of the latter, several unexpected results have appeared. Certain species, which had been determined by the students of the adults to be the same as European forms, turn out to be a mixture of several distinct species. *Culex cantans* is now divided into *C. fitchii*, *C. abfitchii* and "*C. cantans*"; *Culex reptans* is now called in America *C. trichurus*, *C. lazarensis*, *C. æstivalis* and *C. pullatus*; which is to say that these forms would scarcely have been regarded as distinct species from the adults alone on the characters heretofore in use. Now the questions arise, do these forms appear only in America, or are the European species equally composite, and, if so, are all the forms the same as the American ones, or all different, or partly the same and partly different? We want to know. Will not some one in Europe take up this matter and study the mosquito larvæ carefully with a view to the discrimination of species? Or must we ourselves plan an invasion of European territory?

We regret that lack of space compels us to postpone articles by Mr. Snodgrass on the Coulee Cricket and by Mr. Caudell on some Mantids, to the June issue. We send out their plates herewith, however, and think that the delay will not cause any controversy, as there are no new species described in either paper.

Apropos of our use of headings of class and order to precede all articles, we have heard some criticism to the effect that it was an affront to the intelligence of the reader to inform him of such an "obvious" matter. We are, however, recently in receipt of a communication signed by the Secretary of the Smithsonian Institution on behalf of the international catalogue of scientific literature, requesting the class, order and family to which should be referred a short paper published by us in this JOURNAL before the above custom was adopted. If the compilers of bibliographies go to the trouble of correspondence with authors before they can list their works, it needs no further proof of the usefulness of our headings.

LIST OF ACTIVE MEMBERS OF THE NEW YORK AND BROOKLYN ENTOMO- LOGICAL SOCIETIES.

The following names were omitted from the list of members which was printed in the September issue (vol. XII, pp. 193-196) and should be added thereto: Aaron, Eugene, Br. Soc.; Cramer, A. W. P., 142 W. 87th St., N. Y. City, Br. Soc.; Fulda, Carl, M. D., 1096 Halsey St., Brooklyn, N. Y., Lepidoptera, Br. Soc.; Kalbert, John, 181 Russell St., Brooklyn, N. Y., Br. Soc.; Wood, Wm., 51 5th Ave., N. Y. City, Coleoptera, N. Y. Soc.

PROCEEDINGS OF THE NEW YORK ENTO- MOLOGICAL SOCIETY.

MEETING OF OCTOBER 4, 1904.

Held at the American Museum of Natural History. President C. H. Roberts in the chair with thirteen members and one visitor present.

The minutes of the preceding meeting were read and approved.

The treasurer reported that the Society and JOURNAL fund had now a balance of \$842.98.

Mr. Weeks reported that the Brooklyn Entomological Society was now affiliated with the Scientific Alliance of New York City, and suggested that the New York Entomological Society take some action in reference to holding but one meeting monthly.

Mr. William Wood, of 51 Fifth Avenue, was proposed as an active member by Mr. Leng.

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JOURNAL

OF THE

New York Entomological Society.

Vol. XIII.

JUNE, 1905.

No. 2

Class I, HEXAPODA.

Order IV, DIPTERA.

ILLUSTRATIONS OF THE ABDOMINAL APPEN- DAGES OF CERTAIN MOSQUITOES.

BY HARRISON G. DYAR, A.M., PH.D.,

WASHINGTON, D. C.

(PLATES IV AND V.)

It has been shown by Mr. F. V. Theobald that the male genitalia of mosquitoes are of value for purposes of identification, and Dr. E. P. Felt has inaugurated the use of them in the definition of genera. Previous to Dr. Felt's work the genitalia of our species were little known and but few of them figured. It is the purpose of the present article to illustrate some additional species to those which Dr. Felt has made known.

Deinocerites cancer Theob. (Plate IV, Fig. 1.)

Side pieces stoutly conic, basal lobe strongly trifid; clasp thick, truncate, clawed at tip, hirsute on outer aspect. Harpe long, spatulate, smooth, unjointed. Harpago rounded, concave, crested by stout spines. Uncus slender, concave, nearly as long as the harpago. Appendage of the eighth segment undeveloped.

Wyeomyia smithii Coq. (Plate IV, Fig. 2.)

Side piece conic, bent from side view, rather transparent; two stout setæ within; clasp enlarged, membranous, inflated, irregularly lobed, with a few spines. Harpes and harpagones likewise inflated

and irregular. Unci long with terminal teeth. Appendage of the eighth segment distinct, setose.

Grabhamia æstivalis Dyar. (Pl. IV, Fig. 3.)

Side piece elongate, outer lobe distinct and running well toward base; inner lobe rounded, spinous; clasp filamentous with long articulated terminal spine. Harpe jointed, basal part long, a little curved, uniform, apical filament small, less than half the length of the basal part. Harpago smooth, elongate, outer part narrow. Unci invisible. Appendage of the eighth segment distinct, setose.

Grabhamia varipalpus Coq. (Plate IV, Fig. 4.)

Side piece elongate, outer lobe undeveloped, inner rounded and bearing many long fine setæ; clasp filamentous with long terminal spine. Harpe jointed, basal part well curved, uniform, apical filament long, broad, as long as the basal part. Harpago smooth, elongate, outer part narrow for over half its length. Unci invisible. Appendage of the eighth segment distinct, setose.

Grabhamia curriei Coq. (Plate IV, Fig. 5.)

Side piece elongate, outer lobe distinct, reaching toward base; inner lobe rounded with short setæ; a stout terminal seta; clasp filamentous with long terminal spines. Harpe jointed, basal part slender, straight, terminal filament broad, as long as the basal part. Harpago curved, concave, narrowing outwardly. Unci invisible. Appendage of eighth segment narrow and elongate, setose.

Pneumaculex signifer Coq. (Plate IV, Fig. 6.)

Side piece elongate, conic, no outer lobe, inner lobe a slight prominence, a stout curved seta on middle of inner side; clasp filamentous, slightly enlarged outwardly, articulated tip moderate, multiple. Harpe short, conic, concave with trifid apex. Harpago bent, concave with notched tip. Unci invisible. Appendage of eighth segment undeveloped.

Stegomyia fasciata Fab. (Plate V, Fig. 7.)

Side piece short, conic, scarcely longer than wide, without lobes but the inner area finely setose; clasp moderate, constricted somewhat near base, the articulated tip short. Harpe long, broad, chitinous, unjointed, curved at tip and with a branch inwardly near base, smooth. Harpago basal, short, broad, slightly dentose at tip. Uncus a small setose lobe. Appendage of eighth segment undeveloped.

***Feltidia cyanescens* Coq.** (Plate V, Fig. 8.)

Side piece elongate conic, basal lobe very slight, setose ; clasp thick, inflated, reticular, the tip narrowed with a short spine. Harpe curved, concave, spined at tip. Harpago cylindrical, truncate. Appendage of eighth segment undeveloped.

***Feltidia signipennis* Coq.** (Plate V, Fig. 9.)

Side piece elongate conic, basal lobe rudimentary, setose ; clasp thick, inflated, reticular, the tip narrowed with a short spine. Harpe curved, concave, slightly spined at tip.* Harpago cylindrical, truncate. Appendage of eighth segment undeveloped.

***Theobaldia incidens* Thom.** (Plate V, Fig. 10.)

Side piece elongate, conic, lobes undeveloped ; clasp filamentous with minute terminal spine. Harpe bent at tip, stout, uniform, with irregular teeth. Harpago cylindrical, truncate. Unci invisible. Appendage of the eighth segment broad, large, setose. A row of very few short tooth-like spines at the tip of the seventh segment.

***Melanoconion atratus* Theob.** (Plate V, Fig. 11.)

Side piece thickly conic, lobes continuous, the outer with a leaf-like scale, the inner with stout articulated spines ; clasp enlarged at the base, slender outwardly, with minute terminal spine. Harpe stout, concave, narrowed at tip. Harpago small, slender. Unci and appendage of the eighth segment invisible.

***Culex tarsalis* Coq.** (Plate V, Fig. 12.)

Side piece elongate, outer lobe distinct, with leaf-like scale and stout spines recurved at tip ; no basal lobe ; clasp filamentous, curved, with minute terminal spine. Harpe conic, heavily spined at tip ; an additional pair of appendages at base with trifid apex. Harpago broad, acuminate. Uncus long concave, narrowed outwardly. Appendage of the eighth segment stout and broad, setose.

EXPLANATION OF PLATES IV AND V.

Genitalia of mosquitoes, the parts of one side only shown.

1. *Deinocerites cancer* Theob. from Jamaica.
2. *Wyeomyia smithii* Coq. from Massachusetts.
3. *Grabhamia festivalis* Dyar from British Columbia.

* The apparent difference in the direction of curve in the harpes shown in figures 8 and 9 is apparently unimportant, as I have another slide of *signipennis* in which the curve is inward as in *cyanescens*.

4. *Grabhamia varipalpus* Coq. from British Columbia.
 5. *Grabhamia curriei* Coq. from California.
 6. *Pneumaculex signifer* Coq. from Virginia.
 7. *Stegomyia fasciata* Fab. from Texas.
 8. *Feltidia cyanescens* Coq. from Texas.
 9. *Feltidia signipennis* Coq. from Mexico.
 10. *Theobaldia incidens* Thom. from British Colombia.
 11. *Melanoconion atratus* Theob. from Jamaica.
 12. *Culex tarsalis* Coq. from California.
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NEW NEMATOCEROUS DIPTERA FROM NORTH AMERICA.

BY D. W. COQUILLET,

WASHINGTON, D. C.

The present paper is founded primarily on collections made during the summer of 1903 by Messrs. R. P. Currie, H. G. Dyar and A. N. Caudell in British Columbia, and by Mr. H. S. Barber, chiefly in northern California. Messrs. Currie and Barber paid especial attention to the Diptera and succeeded in obtaining many rare and interesting specimens. Only those belonging to the section Nemocera have as yet been studied and the descriptions of the new species are appended herewith. To these are added descriptions of several species received from various sources, bringing the number of new species described in this paper up to 41.

Dicranomyia signipennis, new species.

Distinguished from the described species by the spotted wings in connection with the short auxiliary vein, the apex of which is very near the base of the second vein. Brown, the humeri, scutellum, a spot in front of it, the genitalia, halteres and legs, yellow, a black band before apex of each femur, apices of tarsi brown. Antennae reaching nearly to base of wings, joints three to thirteen of nearly an equal length, the last three or four of these slightly longer than wide. Thorax opaque, grayish pruinose, mesonotum marked with three blackish vittæ. Hypopygium of male rather small. Halteres not unusually long. Wings glabrous indistinctly mottled with pale gray and whitish hyaline, stigma brown, a brown cloud at apex of auxiliary vein, another at forking of second and third veins, one on vein at base of discal, extending over small and hind crossveins, a fourth on veins at apex of discal cell; marginal crossvein close to apex of first vein, auxiliary crossvein close to apex of the auxiliary vein, first section of second vein one and one half times as long as first section of the third, base of discal cell far beyond base of the submarginal, discal cell closed. Length 7 mm.

Eureka, Cal. A specimen of each sex collected in coition June 5 by Mr. H. S. Barber. Type No. 8343, U. S. National Museum.

***Limnobia maculicosta*, new species.**

Marginal crossvein far before apex of first vein, wings spotted, femora without brown bands. Head and its members brown, the labella yellow, joints of antennæ except the second longer than broad, the eighth over twice as long as broad. Thorax somewhat polished, brown, varied with yellow. Abdomen brown, a band near base of second segment, the extreme bases of the other segments, the genitalia and the broad bases of the segments of the venter, yellow. Legs brown, broad apices of the femora, both ends of the tibiæ and bases of the tarsi yellow. Wings hyaline, indistinctly mottled with pale gray and with four rather large, dark gray spots along the front margin — one at base of second vein, another at apex of auxiliary vein, a third on the marginal crossvein, the last one at apex of first vein; the first spot extends only to the auxiliary vein, the other three border the costa; auxiliary vein nearly reaches the base of the submarginal cell and apparently ends in the first vein, with the crossvein a short distance before its apex. Halteres brown, both ends yellow. Length 11 mm.

Kokanee Mt., British Columbia (altitude 8000 feet). A female specimen collected August 10 by Mr. R. P. Currie. Type No. 8344, U. S. National Museum.

***Limnobia bestigma*, new species.**

Near *tristigma* but with only two brown costal spots — one at apex of auxiliary vein, the other on the marginal crossvein. Head and its members brown, the third joint of antennæ and the labellæ yellow; joints of antennæ except the second longer than broad, the fifth and following joints over twice as long as broad. Thorax somewhat polished, yellowish, a median brown vitta on the anterior half, sides of scutellum also brown. Abdomen brown, a median vitta, the genitalia and venter yellow. Legs yellow, broad apex of each femur and tarsus brown, an indistinct brownish band at a considerable distance from the apex of each femur. Halteres elongated, yellow. Wings hyaline, a rather small brown cloud at apex of auxiliary vein and a slightly larger one on the marginal crossvein; the latter cloud is located nearly in the middle of the otherwise pale yellowish stigma; apex of auxiliary vein slightly beyond middle of first section of second vein, its termination and the crossvein as in the preceding species; marginal crossvein far before apex of first vein. Length 9 mm.

Bear Lake, British Columbia. A female specimen collected July 29 by Mr. R. P. Currie. Type No. 8345, U. S. National Museum.

***Rhypholophus divergens*, new species.**

Near *holotrichus*, but the sixth and seventh veins diverging toward their apices, etc. Black, the halteres, trochanters and bases of the femora, yellow, ovipositor of female also yellow. Antennæ of male reaching slightly beyond base of wings, the third joint as broad as long, the eighth and following joints somewhat longer than broad. Thorax densely gray pruinose, not vittate, its hairs and those of the abdomen yellowish; hypopygium rather small, the claspers terminate in a curved hook.

Wings hyaline, stigma pale brown, discal cell opens in the second posterior, sixth and seventh veins very strongly diverging toward their apices. Length 4 mm.

Kaslo (June 18 and 29, R. P. Currie); London Hill Mine, Bear Lake (altitude 7,000 feet, July 21, A. N. Caudell), and Kokanee Mt. (altitude 9,000 feet, on snow August 10, R. P. Currie), British Columbia. One male and four females. Type No. 8346, U. S. National Museum.

***Molophilus nitidus*, new species.**

Base of first submarginal cell opposite base of discal cell, body polished. Black, a streak at each humerus and knobs of the halteres yellow, genitalia yellowish brown. Antennæ reaching base of second segment of abdomen, the third and succeeding joints longer than broad. Hairs of body chiefly brown; claspers consist of a pair of elongated, flattened projections tapering slightly to the apex, devoid of hooks and other processes. Wings grayish hyaline, marginal crossvein slightly beyond base of second submarginal cell, the latter opposite base of first posterior, base of third posterior cell noticeably nearer to base of first submarginal than to that of the second. Length 4 mm.

Fieldbrook, Cal. A male specimen collected May 18 by Mr. H. S. Barber. Type No. 8347, U. S. National Museum.

***Gnophomyia aperta*, new species.**

Discal cell open into the second posterior, hind crossvein at or before base of discal cell. Black, the halteres, trochanters and bases of femora yellow. Antennæ reaches base of third segment of abdomen, the third and following joints longer than broad. Thorax opaque, gray pruinose, mesonotum with a darker median vitta not reaching beyond the suture. Claspers short and robust, each with an apical horny hook. Wings grayish hyaline, apex of auxiliary vein opposite base of second submarginal cell, auxiliary crossvein subobsolete, about length of hind crossvein before apex of auxiliary vein. Length 4 mm.

Kaslo, British Columbia. Two males collected July 11 and 18 by Dr. H. G. Dyar. Type No. 8348, U. S. National Museum.

***Limnophila antennata*, new species.**

Near *quadrata* but the antennæ of the male reach base of sixth segment of the abdomen. Black, the halteres, genitalia coxæ, trochanters, femora and tibiae except apices of the last two, yellow. Antennæ of male cylindrical but tapering to the apex, the third joint as long as the first two taken together, the following joints with a sparse verticil of short hairs near the middle of each. Head and thorax very thinly grayish pruinose. Wings grayish hyaline, stigma brownish, marginal crossvein near apex of first vein, first submarginal cell almost sessile, the second submarginal usually slightly longer than the first posterior cell, base of discal cell slightly nearer to base of wing than is that of the second submarginal, only four posterior cells, hind crossvein near middle of discal cell. Length 7 mm.

Kaslo, British Columbia. Three male specimens, two collected June 11 and July 11 by Dr. H. G. Dyar, the third collected June 22 by Mr. R. P. Currie. Type No. 8349, N. S. National Museum.

Tricyphona aperta, new species.

Near *calcar* but the discal cell is open in the fourth posterior, etc. Yellow, the head black, gray pruinose, the antennæ, palpi and tarsi brownish toward their apices. Wings pure hyaline, stigma obsolete, first submarginal cell longer than the second, base of third vein far beyond the small crossvein, petiole of second posterior cell longer than this cell, subequal to preceding section of the fourth vein. Length 6 mm.

Kaslo, British Columbia. One male and two females collected May 29 and June 10 by Dr. H. G. Dyar. Type No. 8350, U. S. National Museum.

Family CHIRONOMIDÆ.

TABLE OF NEW SPECIES OF CERATOPOGON.

1. Third vein connected with the first by a crossvein..... 6
 Third vein wholly separated from the first, not connected by a crossvein, wings bare, unmarked, fourth joint of hind tarsi at most one half as long as the fifth, claws of tarsi equal or subequal in length 2
2. Last tarsal joint not spined on the under side..... 3
 Last joint fringed with two rows of large spines on nearly entire length of the under side. Black, the broad bases of antennæ, palpi, scutellum, knobs of halteres, first two pairs of tibiæ except their apices, and the tarsi except apices of the joints and the whole of the last one, yellowish. Body opaque, gray pruinose. Femora rather slender, front ones spined on the apical half of the under side, the middle femora not spined, hind ones bearing about five rather slender spines toward the apex of the under side; tarsal claws very long, a large tooth before base of each. Wings hyaline, third vein ends near six sevenths length of wing, apex of first vein before middle of the third, fourth vein forks slightly before the small crossvein. Length 3.5 mm.....*setipes*.*
3. Mesonotum polished and sometimes with gray pruinose vittæ..... 4
 Mesonotum opaque, gray pruinose. Black, knobs of the halteres and the legs yellow, extreme apices of the femora, tibiæ and joints of tarsi brown, broad apices of hind femora and bases of their tibiæ also brown. Abdomen somewhat polished. Femora rather slender, the front ones slightly thickened and bearing three spines on the apical half of the under side, other femora without spines; tarsal claws rather large, not toothed. Wings hyaline, venation as in *setipes*. Length 2.5 mm.....*pruinus*.†
4. Dorsum of thorax unmarked..... 5

* Brownsville, Texas. A female specimen collected March 19 by Mr. C. H. T. Townsend. Type No. 8351, U. S. National Museum.

† Bear Lake, British Columbia. A female specimen collected July 20 by Mr. R. P. Currie. Type No. 8352, U. S. National Museum.

Dorsum of thorax marked with a pair of whitish pruinose vittæ on slightly more than its anterior half, the sides, front angles and greater part of pleura thinly grayish pruinose. Black, bases of the joints of the tarsi yellowish. Abdomen somewhat polished. Femora rather slender, not spined. Wings hyaline, slightly tinged with yellowish in the marginal cell; third vein reaches three fourths length of wing, apex of first vein slightly before middle of the third, fourth vein forks nearly at the small crossvein. Length 2 mm.....*bivittatus*.*

5. Abdomen on basal half yellow, legs chiefly yellow. Black, the halteres, basal half of abdomen, genitalia and legs except knees, apices of tibiæ and whole of last tarsal joint, yellow, a brownish band near middle of hind tibiæ. Mesonotum highly polished. Femora slender, without spines. Wings hyaline, third vein nearly reaches three fourths length of wing, apex of first vein near middle of the third, fourth vein forks slightly before the small crossvein. Length 2 mm.....*flavoniger*.†

Abdomen wholly black, legs chiefly black. Black, the basal half of the antennæ, the palpi, stems of halteres, a band before apex of each front femur, one near apex of first two pairs of tibiæ, and the tarsi, yellow. Body highly polished, thorax gibbous. Femora not spined, rather slender, the hind ones elongated and thickened toward the apices. Wings hyaline, venation as in *flavoniger* except that the apex of first vein is noticeably before middle of the third. Length 1.25 mm.....*gibber*.‡

6. Wings hairy, at least toward the apices.....14
Wings bare 7
7. With at most a small brown spot on either wing, situated on the small crossvein.. 9
With distinct brown markings on the wings..... 8
8. Yellow, a pair of widely separated vittæ on the mesonotum, a streak beneath each wing, the front, lateral and hind margins of the abdominal segments beyond the second, the knobs of the halteres, apices of hind femora and of their tibiæ, also the last joint of their tarsi, black. Antennæ nearly as long as the body, the latter highly polished. Femora rather slender, not spined, first joint of tarsi longer than the following three together, the third slightly shorter than the fourth, the latter less than half as long as the fifth, which bears a pair of stout blunt spines near the base, one of the claws of each tarsus is more than twice as long as the other, the former being unusually long. Wings hyaline, a small brown spot extends from apex of first vein over the small crossvein, a second somewhat larger brown spot reaches from apex of third vein over halfway across the first posterior cell; third vein reaches three fourths length of wing, apex of first vein near one fifth length of the third, fourth vein forks far beyond the crossvein. Length 2 mm.....*pictus*.§

* Eureka, Cal. Four females collected May 24 and June 6 by Mr. H. S. Barber. Type No. 8353, U. S. National Museum.

† Bear Lake, British Columbia. Two males collected July 20 by Mr. R. P. Currie. Type No. 8354, U. S. National Museum.

‡ Cayamas, Cuba. A female specimen collected January 16 by Mr. E. A. Schwarz. Type No. 8355, U. S. National Museum.

§ Virginia. A female specimen collected June 16, by Mr. Theo. Pergande. Type No. 8356, U. S. National Museum.

Black, the first two joints of antennæ, face, halteres, first two pairs of coxæ and their femora except their apices, the apical half of their tibiæ except the extreme apices, all tarsi except the last two joints, and basal two thirds of the hind femora, yellow. Antennæ longer than the body, the latter is highly polished, and with a white pruinose vitta in middle of the pleura. Femora rather slender, the middle and hind ones with two or three spinous bristles near the apex of the under side; first joint of front tarsi as long as the following three together, on the middle and hind tarsi it is as long as the remaining joints, fourth joint of hind tarsi slightly shorter than the third, about one half as long as the fifth, the latter not spined on the lower side, claws large, those of the front tarsi equal in length, on the middle and hind tarsi one claw is nearly twice as long as the other. Wings hyaline, a large spot extends the length of the third vein, and from the costa nearly to the hind margin of the wing, also a narrow border at apex of wing, blackish; third vein reaches five sixths length of wing, apex of first vein slightly before middle of the third, fourth vein forks rather far before the small crossvein. Length 3 mm.....*nubifer*.*

9. Mesonotum polished, or at least not gray pruinose..... 10
 Mesonotum opaque, gray pruinose and with a transverse row of four brown pruinose spots near the middle and with another brown pruinose spot a short distance in front of each of the outer spots. Black, the base of the antennæ, stems of halteres and the legs, yellow, the coxæ, apices of first two pairs of femora and of their tibiæ, the hind femora and their tibiæ, also the apices of the joints of all the tarsi, dark brown, scutellum reddish brown. Pleura gray pruinose, abdomen polished. Femora rather slender, the front ones slightly thickened and spined on nearly the entire length of the under side, middle and hind femora bearing three or four spines near apex of the under side; first joint of tarsi longer than the following three, the last joint of hind tarsi spined on the under side, claws large. Wings hyaline, third vein reaches five sixths length of wing, apex of first slightly before middle of third, fourth forks slightly before the small crossvein. Length 4 mm.....*slossonæ*.†
10. Abdomen black 12
 Abdomen chiefly yellow, tarsal claws equal..... 11
11. Blackish brown, the basal half of antennæ, the palpi, halteres, abdomen except first two segments, and the legs, yellow, the coxæ, greater part of hind femora, bases of middle and hind tibiæ and apices of last joint of tarsi, dark brown. Antennæ reaching slightly beyond base of abdomen. Mesonotum scabrous. Femora not spined, rather slender, the hind ones considerably thickened, first tarsal joint as long as the remaining joints together, none of the joints spined, claws rather large. Wings hyaline, third vein reaches five sixths length of wing, apex of first vein at middle of the third, fourth vein forks before the small crossvein. Length nearly 4 mm.....*magnus*.‡

* Jacksonville, Florida. A female specimen collected by Mrs. A. T. Slosson. Type No. 8357, U. S. National Museum.

† Mt. Washington, N. H. A female specimen, collected by Mrs. A. T. Slosson, for whom this fine species is named. Type No. 8358, U. S. National Museum.

‡ Brownsville, Texas. A female specimen collected in May by Mr. C. H. T. Townsend. Type No. 8359, U. S. National Museum.

four fifths length of wing, apex of first near one third length of the third, the fourth forks a short distance beyond the small crossvein. Length 1 mm.

maculipennis.*

17. Second joint of hind tarsi at most two thirds as long as the first.....18

Second joint as long as the first. Black, the antennæ yellowish brown, halteres yellow, legs brown, the knees, a ring above middle and the apices of the hind tibiae yellow, narrow apices of the tarsal joints whitish. Antennæ reaches base of abdomen, joints two to nine slightly longer than wide, the twelfth twice as long as wide. Wings densely haired, grayish and with a large whitish spot near apex of first three posterior cells, nearly whole of fourth posterior cell whitish; third vein reaches middle of wing, apex of first near that of the third. Fourth joint of hind tarsi as long as the fifth, claws small, equal. Length 1 mm

cinctipes.†

18. First joint of hind tarsi slender, hind tibiae without a spine at apex..... 19

First joint of hind tarsi swollen, hind tibiae with a black spine at apex of inner side. Black, the basal half of antennæ, mouth parts, scutellum, halteres and legs, yellow. Plumosity of antennæ yellowish. Mesonotum thinly gray pruinose and clothed with golden yellow hairs. Legs rather slender, very hairy, first joint of hind tarsi nearly as long as the following two, the fourth slightly longer than the fifth. Wings hyaline, wholly densely haired, third vein reaches middle of wing, apex of first near two thirds length of third. Length 1.5 mm.....*calcaratus*.‡

19. Mesonotum black, almost velvety, the gray pruinosity scarcely apparent. Black, a yellow humeral dot and the scutellum brownish yellow, knobs of halteres chiefly yellow, legs dull yellowish or brownish. Antennæ of female reaching beyond base of abdomen, joints two to nine slightly longer than wide, the tenth over twice as long as wide; in the male the plumosity is black, tipped with gray. Hairs of body chiefly black. Second joint of hind tarsi two thirds as long as the first, the fourth slightly shorter than the fifth. Wings hyaline, nearly covered with hairs, third vein reaching slightly beyond middle of wing, apex of first near two thirds length of the third. Length 1 to 1.5 mm.

tenebrosus.§

Mesonotum densely gray pruinose. Black, the halteres yellow, the antennæ and legs dull yellowish. Antennæ of female reaches beyond base of abdomen, joints two to nine slightly longer than broad, joint ten three times as long as broad; plumosity of male antennæ blackish and with gray tips. Hairs of body chiefly yellow. First joint of hind tarsi as long as the following two, the fifth slightly longer than the fourth. Wings hyaline, a small white spot

* Jacksonville, Florida. A female specimen collected by Mrs. A. T. Slosson. Type No. 8366, U. S. National Museum.

† Biscayne Bay, Florida. A female specimen collected by Mrs. A. T. Slosson. Type No. 8367, U. S. National Museum.

‡ Frontera, Tabasco, Mexico. A male specimen collected February 19, by Mr. C. H. T. Townsend. Type No. 8368, U. S. National Museum.

§ Eureka, Cal. Four males and three females collected May 22, 24 and June 3 by Mr. H. S. Barber. Type No. 8369, U. S. National Museum.

just beyond apex of third vein, the latter reaches two thirds length of wing, apex of first vein near four fifths length of the third, costal vein considerably widened near the apex. Length 1 mm.....*unicolor*.*

***Tanypus miripes*, new species.**

Near *hirtipennis* and *pilosellus* but in these the fourth joint of the tarsi is slender and at least two thirds as long as the third, while the fifth is only slightly smaller than the fourth. Yellow, the antennæ, mouth parts, three vittæ on the mesonotum, the metanotum, and the front ends of the segments of the abdomen, brown. Plumosity of antennæ brown, the apices yellow. Body opaque, grayish, pruinose, the hairs yellowish white. Tarsi with rather long pubescence but not distinctly bearded, the front and hind ones slender and elongated, the middle ones rather robust, the last three joints rather short, the fourth about one half as long as the third, the fifth unusually small, wings densely haired, hyaline, a brown cloud on the small cross-vein, in certain lights an indistinct brownish cloud in outer half of anal cell and a crossband of the same color near three-fourths length of wing; first vein forked a short distance before the apex, crossvein at apex of second basal cell situated slightly beyond base of upper branch of fifth vein. Length 4.5 mm.

Eureka, Cal. A male specimen collected May 22 by Mr. H. S. Barber. Type No. 8371, U. S. National Museum.

***Tanypus sinuosus*, new species.**

Near *johnsoni* and *bifasciatus*, but differing from both by the very sinuous second brown crossband of the wings. Yellow, varied with whitish, the legs wholly whitish, the mouth parts, and in the male the antennæ except the first joint, a spot in front of each wing, a pair of spots in front of the scutellum, the front ends of the abdominal segments and nearly the whole of the last two segments, brown, in the female with three brown vittæ on the mesonotum, the median one divided in the middle by a yellow line. Plumosity of antennæ gray basally and yellow distally, appearing wholly yellow in certain lights. Body opaque, hairs yellow and with several brown ones on the abdomen of the male. Tarsi slender, fourth joint much longer than the fifth, front tarsi of male bearded with rather long hairs. Wings densely covered with hairs, hyaline, a faint brownish crossband passes over the crossveins and is expanded in the anal cell; a broader brownish crossband begins on the costa just beyond the forking of the first vein and extends almost to the upper branch of the fifth vein, then turns towards the base of the wing for a short distance and then again changes its course and reaches the hind margin of the wing just before the apex of the lower fork of the fifth vein; the proximal edge of the upper portion of this crossband is nearly on a line with the distal edge of the lower portion; an indistinct brownish cloud on apex of fourth vein and of upper branch of the fifth; first vein forked toward its apex, crossvein at apex of second basal cell slightly beyond the forking of the fifth vein. Length 2 to 3 mm.

Center Harbor (Aug. 3, H. G. Dyar) and Franconia, N. H.

* Eureka and Fieldbrook, Cal. Two males and eight females collected May 22, 31, June 3, 5 and 6 by Mr. H. S. Barber. Type No. 8370, U. S. National Museum.

(Mrs. A. T. Slosson). Three males and two females. Type No. 8372, U. S. National Museum.

Tanypus nubifer, new species.

Distinguished by the spotted, bare wings. Yellow, the first antennal joint, palpi, three vittæ on the mesonotum, lower portion of thorax, the metathorax, and bases of abdominal segments, brown, the legs whitish. Plumosity of antennæ gray, but appearing yellowish in certain lights. Body opaque, gray pruinose. Tarsi slender, the fourth joint longer than the fifth, front tarsi bearing many long hairs. Wings bare, whitish hyaline, a brownish cloud on the small crossvein, two near middle of first posterior cell, one beyond middle of second posterior cell, one near apex of posterior branch of fifth vein and about four in the anal cell, some of the latter very faint; first vein forked before the apex, fifth vein forks a short distance beyond the crossvein. Length 3 mm.

Salt Lake, Utah. Two males collected June 26 by Mr. H. S. Barber. Type No. 8373, U. S. National Museum.

Tanypus heteropus, new species.

Black, the halteres light yellow. Plumosity of male antennæ yellowish brown. Thorax opaque, mesonotum with three blackish vittæ; hairs of abdomen whitish. Tarsi not bearded, the fourth joint short and dilated, shorter than the fifth. Wings hyaline, bare, first vein simple, the fifth forks a short distance before the crossvein. Length 3 to 4 mm.

Pullman, Washington (March 26 and April 9, R. W. Doane); Las Vegas Hot Springs, N. M. (March 21, T. D. A. Cockerell); Mt. Washington, N. H. (Mrs. A. T. Slosson). Nine males and one female. Type No. 8374, U. S. National Museum.

Tanypus tenebrosus, new species.

Near *pilosellus* but much larger, the body chiefly black, etc. Black, the antennæ of female except the first joint, the scutellum, sides of male abdomen, legs and halteres, yellow. Plumosity of male antennæ grayish brown, appearing partly whitish in certain lights. Tarsi slender, the front ones not bearded, the fourth joint longer than the fifth. Wings hyaline, densely covered with hairs, first vein simple, the fifth forks slightly before the crossvein. Abdomen of female spatulate, widest at the fifth and sixth joints. Length 3 to 4 mm.

Franconia, N. H. One male and two females collected by Mrs. A. T. Slosson. Type No. 8375, U. S. National Museum.

Chasmatonotus fascipennis, new species.

Black, the bases of antennæ, middle of pleura, base of venter, halteres, trochanters and bases of femora, yellow. Body polished. Wings brownish, the base broadly, a broad crossband just beyond forking of the fifth vein, and the very narrow apical margin of the wing, prolonged along the posterior margin to the median crossband, whitish hyaline, the crossband changing to yellowish in front of the third vein. Length 1.5 to 2 mm.

Kaslo Creek, British Columbia. Thirty-five specimens, collected June 17 and 18 by Messrs. R. P. Currie and A. N. Caudell. Type No. 8376, U. S. National Museum.

***Chasmatonotus hyalinus*, new species.**

Yellow, the mesonotum yellowish brown and with a black dorsal vitta, abdomen dark brown, tarsi, tibiae and femora except their bases, pale brown. Body polished. Wings grayish hyaline, somewhat smoky in front of the third vein. Length 1.5 mm.

Eureka, Cal. A male specimen collected May 24 by Mr. H. S. Barber. Type No. 8377, U. S. National Museum.

Family MYCETOPHILIDÆ.

***Sciophila fuscipennis*, new species.**

Distinguished by the dark brown wings. Black, the femora, tibiae and bases of the tarsi and of the halteres, yellow. Mesonotum polished, its hairs chiefly yellow, the marginal bristles mostly brown, hairs of abdomen chiefly brown. First joint of front tarsi about two thirds as long as the tibiae. Wings dark brown, auxiliary vein terminates in the first near middle of the marginal cell, petiole of second posterior cell subequal in length to the small crossvein, fifth vein forks far before the small crossvein. Length 6 mm.

Kaslo, British Columbia. Two females collected June 1 and 10 by Messrs. H. G. Dyar and R. P. Currie. Type No. 8378, U. S. National Museum.

***Sciophila simplex*, new species.**

Near *calcarata* but the middle coxæ are without spines, etc. Black, the mouth parts, bases of antennæ, a humeral spot, base of venter, halteres, coxæ, femora, tibiae, bases of tarsi, and hind borders of abdominal segments of the female, yellow, hind coxæ usually marked with brown. Antennæ elongate, the joints beyond the second over twice as long as wide. Body opaque, densely gray pruinose, the hairs black. First joint of front tarsi slightly longer than the tibiae. Wings hyaline, auxiliary vein ends in costa near or beyond middle of marginal cell, petiole of second posterior cell about six times as long as the small crossvein, fifth vein forks slightly before the small crossvein. Length 4 to 6 mm.

Antoine Mine, McGuigan (July 26, Anderson), London Hill Mine, Bear Lake (July 21, 28 and 29, R. P. Currie and A. N. Caudell), and Kokanee Mt. (August 11, R. P. Currie), British Columbia. Ten males and one female. Type No. 8379, U. S. National Museum.

***Sciophila brevivitta*, new species.**

Near *obliqua*, but in that species the median brown vitta on the mesonotum extends to the scutellum, the petiole of the second posterior cell is as long as that cell, etc. Yellow, the upper part of the head, the antennæ beyond the fourth joint, three vittæ on the mesonotum, three spots on the pleura, the lower part of the metanotum,

broad hind margins of the first five abdominal segments and the whole of the following two, also the apices of the tarsi, black. Body polished, the hairs black; median vitta of mesonotum paler than the others, not extending on the posterior fourth of the mesonotum, divided in the middle by a yellow line; scutellum chiefly brownish. First joint of front tarsi slightly shorter than the tibiae. Wings hyaline, auxiliary vein ends in the costa near or beyond middle of marginal cell, petiole of second posterior cell less than half as long as that cell, fifth vein forks before the small crossvein. Length 4 mm.

Kaslo, British Columbia. Three males collected May 30, June 12 and 20 by Messrs. H. G. Dyar and R. P. Currie. Type No. 8380, U. S. National Museum.

Anaclinia coxalis, new species.

Black, the humeri, femora, tibiae, inner side and narrow apices of front coxae, and the halteres, yellow. Body somewhat polished, thinly gray pruinose, the hairs yellowish. First joint of front tarsi longer than the tibiae. Wings hyaline, venation normal. Length 5 mm.

London Hill Mine, Bear Lake (July 21, R. P. Currie, July 29, A. N. Caudell), and Kaslo (June 26, H. G. Dyar), British Columbia. Type No. 8381, U. S. National Museum.

Lejomya hyalina, new species.*

Yellow, the antennae except at base, a spot on the front, three spots on the pleura, middle of metanotum, hind margins of abdominal segments, also apices of tarsi, black. Body polished, the short hairs yellow, the longer hairs and bristles of mesonotum and scutellum chiefly brown. First joint of front tarsi as long as the tibiae. Wings hyaline, upper branch of fifth vein usually interrupted at the base. Length 4 mm.

Las Vegas Hot Springs, N. M. Four specimens collected August 11 to 14 by Mr. H. S. Barber. Type No. 8382, U. S. National Museum.

Mycetophila vitrea, new species.

Distinguished by the hyaline wings in connection with the presence of long bristles on the inner side of the middle tibiae. Black, the face, mouth parts, bases of antennae, halteres and legs, yellow, apices of tarsi brown. Body polished, the hairs yellowish, the bristles black. Lateral bristles of front tibiae shorter than greatest diameter of the tibiae, many of those on the other tibiae about twice this diameter, middle tibiae bearing a very long and a short bristle on the inner side, hind tibiae devoid of bristles on the inner side. Wings hyaline, tinged with yellowish and gray along the costa, auxiliary vein obliterated apically, fifth vein forks opposite the small crossvein. Length 2.5 mm.

* *Lejomya* Rondani, 1856, = *Lejosoma* Rondani, 1856, = *Glaphyroptera* Winertz, 1863, preoccupied, = *Neoglaphyroptera* Osten Sacken, 1878.

Delaware Water Gap, N. J. (July 12, C. W. Johnson), and Kaslo, British Columbia (June 11, H. G. Dyar). Two specimens. Type No. 8383, U. S. National Museum.

***Ceroplastus terminalis*, new species.**

Near *clausus*, but the wings are distinctly marked with dark gray toward their apices, the united portion of the third and fourth veins is longer than the succeeding section of the fourth vein, etc. Yellow, the antennæ, an ocellar spot, a median pair of lines on the mesonotum which diverge strongly anteriorly and are united posteriorly, the knobs of the halteres and apices of the tarsi, brown. Antennæ about as long as the thorax, the last joint slightly longer than wide, the others wider than long. Wings hyaline, tinged with yellow along the costa, the apices broadly and hind margin from apex of axillary cell more narrowly bordered with dark gray, which is considerably prolonged along the posterior branch of the fifth vein, a lighter gray spot in apex of the first and of the second posterior cell, the gray color extends along the third vein to a point a short distance basad its upper branch, the latter terminates in the first vein a considerable distance before the apex, auxiliary crossvein slightly beyond the humeral, apex of auxiliary vein beyond the union of the third and fourth. Length 10 mm.

Kaslo, British Columbia. A male specimen collected July 16 by Mr. R. P. Currie. Type No. 8384, U. S. National Museum.

**A CHIRONOMID INHABITANT OF SARRACENIA
PURPUREA, METRIOCEMUS KNABI COQ.**

BY FREDERICK KNAB,

URBANA, ILL.

(PLATE VI.)

During the course of a season's work upon culicid larvæ the writer examined the liquid contents of many leaves of the pitcher-plant, *Sarracenia purpurea*. It was found that the water in these leaves contained, besides larvæ and pupæ of the mosquito *Wyeomyia smithii*, two other forms of dipterous larvæ. One of these was a large maggot of the brachycerous type, perhaps the larva of Riley's *Sarcophaga sarracenia*, a species which he bred from the leaf contents of *Sarracenia variolaris*.* The other was a small, pale chironomid larva.

The first material was collected on July 30, 1903, on the boggy shores of a pond a few miles from Westfield, Massachusetts. Of the pitcher-plant leaves examined none contained more than one of the

*C. V. Riley: Descriptions and natural history of two insects which brave the dangers of *Sarracenia variolaris*. (Trans. Acad. Sci., St. Louis, 1874, v, 3, p. 235-240).

large maggots. However in most leaves numerous individuals of the chironomid larva were present, indeed, they were often more abundant than the larvæ of *Wyeomyia*. In many leaves all three forms of larvæ were found associated. In some leaves the water was converted into an extremely foul liquid, through the decay of large insects that had been entrapped, and in such only the large maggot occurred. But the chironomid larvæ also can endure quite foul water, for in one case they were numerous in a leaf in which had been drowned one of the large *Spirobolus marginatus*.

The chironomid was at once thought to be an unknown form and received such attention as circumstances permitted. Some of the larvæ were reared and produced a little black fly which runs actively but does not take flight so readily as most of its allies. Specimens of the fly were sent to Mr. D. W. Coquillett and were described by him as *Metriocnemus knabi* in the Canadian Entomologist, vol. 36, p. 11. The genus *Metriocnemus* had not previously been reported from the North American continent, although it is a large and widely distributed one and species are known from Greenland and elsewhere in the Arctic region, Europe, South America and Australia. Apparently nothing has been made known regarding the early stages in this genus.

The larvæ of the present species live at the bottom of the water-filled leaf-cups of *Sarracenia purpurea*, burrowing in the closely packed débris composed of the fragments of decayed insects; evidently their food is from this source. These larvæ, unlike those of most species of Chironomidæ, make no tubes. Upon the first occasion only larvæ were found, but this is doubtless because the pupæ were not discovered in their unusual situation. Upon August 23 the locality was visited again and this time pupæ were found — in a most abnormal situation for a chironomid.

Upon the inner surface of the pitcher, just above the water level, was a mass of a clear gelatinous substance, and within this the pupa was suspended in a perpendicular position, head uppermost. Sometimes there were a number of these pupæ in a row, each in its own globule of jelly. When the larvæ pupate close to each other the gelatine secreted by them forms a confluent mass. The jelly mass of an isolated pupa is elongate, slightly flattened, and its lower end extends slightly into the water. So transparent is the jelly that the lower submerged end is scarcely visible, but its tip is indicated by a more opaque portion, which is the cast off larval skin. By this contact with the water the jelly mass is prevented from drying up before the imago can

emerge. When the imago is about to emerge the pupa wriggles to the surface of the gelatinous case. The fly is disclosed within two or three days after pupation.

The writer has found an account of one other species of Chironomidae which pupates within a gelatinous case, but under widely different conditions. It is the European *Chironomus minutus* Zett., of which the early stages are made known by T. H. Taylor in Miall and Hammond's "The Harlequin Fly," p. 11-13. The larva of this insect pupates within a gelatinous case attached to a submerged stone in a stream. The case is perforated by a passage occupied by the pupa and by constant undulations of the pupal body a current of water is kept flowing through the case.

On the other hand, the larva of our *Metriocnemus* forms its gelatinous case above the surface of the water, and there is no passage through the gelatine, but the pupa hangs imbedded in the mass. The pupa, unless disturbed, remains motionless until the time of emergence. The pupa is remarkable also in the entire absence of breathing organs, usually present in chironomid pupæ either in the form of "trumpets" or as tufts of filaments. In the pupa of the above-mentioned *Chironomus minutus* the respiratory trumpets are present, but are extremely small. O. A. Johannsen, in "Aquatic Insects in New York State," has described the pupæ of two species of Chironomidae, which apparently are also without breathing organs. The pupa of *Diamesa waltlii* Meigen is stated to be destitute of the thoracic respiratory appendages, but it is suggested that the three pairs of short hollow filaments at the tip of the last segment may have a respiratory function. In the description of the pupa of *Thalassomyia obscura* (Johán.) no mention is made of respiratory organs, and from the accompanying figure it is to be inferred that they are absent. While no direct statement is made of the pupal habitat of these two species, it appears that pupation takes place within the case previously occupied by the larva.

Metriocnemus knabi appears to have a wide distribution and its range is probably limited only by that of its host-plant. In addition to the locality first mentioned, a bog at Wilbraham, Mass., in which *Sarracenia purpurea* flourishes, furnished me both larvæ and pupæ on August 28, 1903. Early in the spring of 1904, Dr. Geo. Dimmock collected numerous larvæ of various sizes near Springfield, Mass. The larvæ, with those of *Wyeomyia smithii*, were found in the frozen contents of the pitcher plant leaves. Some of these larvæ, under the

influence of indoor temperature, soon pupated and the first imago appeared upon March 15 after a pupal period of three days. Larvæ of this species were collected from *Sarracenia* leaves by Dr. A. D. Hopkins at Boardman, N. C., on April 4, 1904.

In the collection of the Illinois State Laboratory of Natural History are larvæ taken from leaves of *Sarracenia purpurea* at Cedar Lake, Illinois, on June 19, 1892. From the data given it appears that the larvæ may be found at all seasons of the year and that there are no well marked broods. Development proceeds more or less rapidly, depending upon the necessarily variable food supply and upon the temperature. Like the larva of *Wyeomyia* that of *Metriocnemus* is extremely hardy and can linger a long time without food. Of those collected in August, and kept in the original liquid in a tin covered breeding jar, some were still alive early the following April and some few of these completed their transformation; the remainder however were all dead by the end of the month.

Following are descriptions of the larva and pupa of *Metriocnemus knabi*.

Larva (fig. 1). Form long and slender, of the ordinary chironomid type. Length about 7 mm. Color very pale yellow, the head and the appendages of the ninth abdominal segment bright brownish yellow. The body is sufficiently translucent to permit the dark digestive tract and the tracheal tubes (in the form of two silvery sinuate lines) to be readily seen. The tracheal tubes are well developed and may be distinguished through their whole course, until they break up into finer branches in the head and in the ninth abdominal segment. Head rather small, longer than wide, tapering slightly towards the front. The foramen very wide, broadly margined with black. Clypeus prominent, about half the width of the head. Eyes small, in front of the middle, almost lateral. Antennæ (fig. 2) inserted well forward, rather prominent, of four segments; the basal segment large and stout, about three times as long as wide; second segment very slender, about a third the length of the first; third segment still more slender and shorter than the second; fourth segment very small and slender, tapering to a point; upon the apex of the basal segment, inserted beside the second segment, is a large spine or appendiculate segment equalling in length the three outer segments. Mandibles (fig. 3) prominent, stout at base; the outer half slender, curved, tapering to a point and with four teeth upon the inner margin; basal portion greatly dilated and hollowed out, with a large opening upon the inner side; attached to the inner side near the base is a fan-shaped brush of 7 or 8 long hairs with a common base. Labrum (fig. 4) large and rounded, hinged to the head by a narrower flexible strip; the front of the labrum projects over and bears a number of spines and setæ; beneath, well forward and medianly, is a group of curious ciliate appendages and outward from these, a pair of stout curved appendages with densely tufted apices projects downward. These last mentioned appendages appear to correspond to the "mouth tufts" of mosquito larvæ. Beneath, the head is flattened and the epicranial plates are completely fused.

On each side of the mouth a large, broadly rounded, flat lobe projects forward, covering the base of the mandible. Scattered over its surface are a number of setigerous papillæ and along the inner margin several spines. At the apex are the minute rudimentary maxillæ. The labial (fig. 4) plate is very large with a median slightly toothed portion flanked on each side by five larger teeth. Overlapped by the labial plate, and of similar outline with it, is the hypopharynx which bears an elaborate arrangement of spines and setæ.

Body of 13 segments, of nearly equal diameter throughout. Prothoracic segment somewhat longer than the succeeding ones; anteriorly, upon its ventral surface is a large retractile proleg. This is very broad, about three fourths the width of the segment, and about half its length when extended. It is cleft for a short distance and the two lobes are crowned with a dense brush of coarse simple hairs. Behind these brushes are fine transverse ridges beset with minute spines, and these ridges are placed in a series of about twenty closely set rows. The meso- and metathoracic segments are short and almost fused together. There are no appendages of any kind until the ninth and tenth abdominal segments are reached (fig. 5). The ninth abdominal segment bears dorsally and ventrally a pair of tubular appendages, broadened at the base and bearing at the apex a group of six stout and long black setæ. The anal segment is short and less in diameter than the preceding ones. At its tip, dorsally, are four small leaf like blood gills and below these a pair of fleshy extensible prolegs. The prolegs bear a circlet of large hooks of varying shapes and nearly all of them dentate (figs. 6-11).

Pupa (figs. 12, 13). Form rather elongate. Length 3.5 to 4 mm. Color cream yellow, the disc of the thorax pale brownish yellow. Eyes ferruginous, the very small accessory eye black. Eyes prominent and near the apex of the pupa, the minute accessory eye below the compound eye and in contact with it. The antennæ pass behind the eyes in a prominent ridge. The wing pads extend nearly to the lower margin of the second abdominal segment. Segments 2-8 with a dorsal transverse ridge above the hind margin crowned by a crowded row of minute, rounded spines pointing backward; a ferruginous line along their base. A fine dark line defines the front margin of the scuta on these segments. Dorsally at the base of segments 3-8 there is an area densely clothed with coarse bristles, concolorous with the body. The ventral surface of the abdomen is glabrous. At the tip of the body are four rather small laminate appendages which are margined with ferruginous. The larger upper pair lies in a transverse plane, the lower pair is turned obliquely downward.

EXPLANATION OF PLATE VI.

Metriocnemis knabi Coq.

Fig. 1. Larva.

Fig. 2. Antenna of larva.

Fig. 3. Mandible.

Fig. 4. Labial plate, hypopharynx and labrum (a part of the overhanging dorsal surface of the labrum is seen above).

Fig. 5. Ninth and tenth abdominal segments of larva.

Figs. 6-11. Hooks of posterior prolegs.

Fig. 12. Pupa in its gelatinous case.

Fig. 13. Tip of pupal abdomen, dorsal view.

A NEW MOSQUITO.

BY HARRISON G. DYAR,

WASHINGTON, D. C.

Culex mitchellæ, new species.

This form was collected by me in southern Georgia and Florida in temporary pools of fresh water. The adult resembles *sollicitans*, but the wing scales are wholly black, the first tarsal joint is devoid of a light colored median band and the light colored scales of the legs are pure white instead of yellow. Types, 61 specimens, U. S. National Museum, type No. 8407; one ♀ selected as the type is from Jacksonville, Fla., the larvæ in dirty recently dug holes along the railroad. Other localities are Green Cove Springs in temporary pools in the pines, Magnolia Springs in pools in swampy land, Kissimmee, in ditch, puddles and pools at the edge of swampy land, Pokatee, Fla., in a hole with old tin cans and rotten wood, and in the pine barrens of southern Georgia in a puddle by the railroad at a siding. The larva closely resembles that of *sollicitans*, but the air tube is considerably longer, being fully three times as long as wide, while the spines of the comb are unusually long and thorn-shaped.

It gives me pleasure to name this species in honor of Miss Evelyn G. Mitchell.

Class I, HEXAPODA.

Order XI, ORTHOPTERA.

THE COULEE CRICKET OF CENTRAL WASHINGTON. (*PERANABRUS SCABRICOLLIS* THOMAS.)

BY ROBERT E. SNODGRASS,

STANFORD UNIVERSITY, CAL.

(PLATES I AND II.)

"Coulee Cricket" is a name that may be appropriately given in the state of Washington to the large cricket-like Locustid, *Peranabrus scabricollis* Thomas, that lives in such immense bands in the northern half of Douglas county. The name is fitting because the insects are found principally in or about the dry cañons known as *coulees*, the chief of which are two great gorges named Grand Coulee and Moses Coulee.

The insects are large, fat, soft-bodied creatures, about an inch and a half in length and of a dark reddish-brown color. The males (fig. 1) have very short wings used for stridulating only; the females (fig. 2) are wingless.

They live in bands of many hundred thousands, perhaps millions of individuals and have lately become a menace to crops. In most places they live on desert or "scab-land" areas where there is nothing of importance for them to destroy. Some of the bands, however, are migratory, and during the last few years have made their way into cultivated parts, doing considerable damage to unprotected fields of young wheat, and of course threatening with destruction any country in their line of march—for they clear off nearly everything as they advance.

One of these moving bands coming toward Waterville from the south side of the Badger mountains was visited by the writer the first part of June in 1903. A stationary band living about a mile and a half east of Coulee City was visited during the latter part of June in 1902, and the same site was visited again in June of 1903, but there were then no crickets to be found there. The crickets were observed also during July of 1902 from Coulee City south along the east side of Grand Coulee as far as the railroad station of Adrian.

Nothing has yet been recorded concerning the hatching of the eggs or the growth of the young crickets. By the first of June, however nearly all reach maturity and adult life continues from then until the middle of July.

The adult crickets are fat and lazy-looking creatures, living on the ground and in the low bushes of the arid region they inhabit. The majority of them keep moving about most of the time, but, except when migrating, they go in no general direction and the confines of the band remain pretty definite. On the other hand, many may be seen remaining motionless for a long time, especially while sitting in the bushes.

Their customary gait is a slow walk, but when disturbed they jump. Their rate of progression when on an ordinary walk is about ten feet a minute. When they jump they cover at one leap from three to four inches. They have no fear of a person and only get out of one's path to avoid being stepped on. If allowed to do so they will climb all over one's clothes and even to the top of one's hat. Workmen that learn to disregard them often become covered by them while working or standing in an infested field.

The males and females do not differ in their ordinary habits, except that most of the time the males perform a chirping stridulation with their short wings. The females are wingless and consequently silent. The usual chirps of the male are uttered in regular and rather slow succession, averaging between 90 and 100 a minute. One, while stridulating for three minutes, made 97, 97 and 96 chirps a minute respectively. When disturbed, they stridulate sharply and rapidly in short, quick series of chirps having a decidedly angry tone.

Their food may be said to consist normally of plants. In some places they completely strip the vegetation of leaves and blossoms, and, where migrating leave behind them a great tract of devastation. On the other hand, individuals in stationary bands may be watched for a long time and never be seen to eat of the plants they inhabit. Where such bands exist the vegetation shows no evidence of the presence of the insects. Although their appetite for plant food is thus rather erratic, and hard to account for in its variation, they have a liking for flesh that is insatiable and which, owing to the absence of other means for satisfying it, commonly leads to cannibalism. It is a frequent sight to see one or several individuals eagerly devouring one of their comrades, the latter generally not yet dead. They apparently never attack and disable a healthy individual, but, whenever one becomes injured or weakened from any cause his neighbors at once turn upon and devour him alive. Mercy or feeling for another's pain are sentiments they have no notion of. Since an individual does not die until almost completely destroyed, many gruesome sights may be seen. Such fragments as a head, one side of the body, the ovipositor and a leg or so remain alive, and the palpi and ovipositor move about and the legs kick until all is devoured.

A female was observed eagerly feeding on the viscera of a male who was lying on his back. She was pulling the intestine out through a hole in the side of the male's abdomen regardless of the kicking and struggling of the victim. Presently another male came along and shared in the feast, the poor male that was having his vitals pulled out of his body struggling still more desperately, but this did not appear to affect the appetites of his devourers. Soon the female pulled off a leg and sucked out the contents through the open end with great relish. Then she went back to feeding through the hole in the abdomen.

In another interesting case a male was seen carrying off a live head and thorax with most of the alimentary canal attached. Two other

individuals made pursuit, one catching hold of the protruding viscera and pulling out a long piece of intestine. The other pursuer immediately grabbed the other end of the piece and for a while they had a fierce tug of war for possession. Finally one gave up and the other ate the capture. Then both hurried again after the first one but he had made good his evasion.

Such cannibalistic sights are common. If an individual is injured and thrown among the others he is at once attacked and eaten. But fresh meat of any sort is devoured with equal avidity. During the early part of the mornings there are generally to be seen a large number of half dead females being eaten. The females apparently weaken and die on the morning after they lay their eggs. These spent females form the breakfast of a large number of the well ones.

The crop contents of several individuals taken in the midst of a cannibalistic meal consisted of a dark brown, pulpy mass. Many other crops taken from specimens of the Coulee City band contained the same sort of mass. In fact, only one was found containing vegetable matter—a green, pasty mass easily recognizable as plant food. Only one or two individuals were ever seen here feeding on vegetation; they appeared to subsist almost entirely on one another, especially on the females that succumbed in the mornings. This, however, as before stated, is not true of all the bands. Those in the Badger Mountains were seen voraciously feeding on vegetation, and in several places young wheat fields have been completely destroyed by them.

The large band that in the summer of 1902 was living about a mile and a half east of Coulee City was apparently a stationary colony. Residents in and about Coulee City said the crickets had been at the same place in about the same numbers for years back. They knew nothing of migratory habits in connection with them. The writer observed the females laying eggs here in abundance during June of 1902. When the site of the colony was visited again during the same month in 1903 not a cricket was to be found. Nobody knew anything about them except that they had not been seen as customary in other years. But no one could state whether they had hatched out in the spring and had later moved off, or whether the eggs never hatched. What actually became of this band is still to be determined.

The migratory bands live on the west side of Grand Coulee and have mostly started from the southern end of Moses Coulee. The writer visited one of these travelling hordes that had made its way in a

northeast direction across the Badger Mountains to within six or seven miles of Waterville by the 9th of June, 1903. A force of men was at work in front of them constructing a low fence to prevent their farther advance toward the wheat fields a mile or so beyond at the base of the mountains. These crickets were said to have travelled fifteen miles during the three weeks previous. Two years ago they came up out of the southern part of Moses Coulee and caused the farmers a great deal of trouble about Southside. Their migration this year toward Waterville from Southside over the Badger Mountains is their first visit to this region.

Where the crickets were checked by the fence they became densely massed and the vegetation was here utterly ravished by them. One could discern from a distance a striking contrast on the opposite sides of the fence. Evidently the insects here travelled for food.

During the morning and the early part of the afternoon the members of this travelling community behaved the same as those of the stationary Coulee City band. But the men at work along the fence confidently stated that between three and four o'clock in the afternoon the crickets would begin to travel, and that soon the ground would be covered by a dense crawling mass of the insects all moving steadily along in one direction. This prediction the writer saw verified the same day.

In any band the members are most of the time moving about but they simply go back and forth in any direction. Here, however, a little after three o'clock in the afternoon, many of the crickets were to be seen walking continuously along in a northeast direction. Toward four o'clock the number moving thus had greatly increased, while shortly after four not an individual was stationary — all were moving silently and steadily along in an unswerving course to the northeast. An average rate of progress was ten or twelve feet a minute. Feeding had entirely ceased and all individuals that were in the bushes came down to the ground which now became crowded. If any one lagged he was simply hustled along by those coming behind. Soon they became so massed that it was impossible for any one of them to go in any other direction than that of the crowd or even to stand still. Near the fence, which was placed across the predicted line of march the scene was something marvellous. Over thousands of square feet the crickets were simply massed together, there being on much of this crowded area actually a cricket to every

square inch of surface. About fifteen crossed any given point every minute. Between two points two inches apart one hundred and fifty crossed in five minutes, and, by another count ninety in three minutes, either giving thirty in one minute. This would be fifteen in single file. When they reached the fence they systematically turned to the right, *i. e.*, to the east, whether the ground sloped uphill or downhill, and travelled parallel with the fence. A few tried to climb over.

The fence consisted merely of six-inch boards set on edge, banked with earth on the side away from the crickets, and topped with a strip of tin projecting about an inch toward them and bent slightly downward. Many miles of this had been constructed in the Badger Mountains and it effectually kept the crickets back from the wheat fields in the valley below. By means of ditches and holes dug along the inner side of the fence enormous numbers of the insects were captured and killed. The moving horde simply flowed over the edges of these holes like some viscid liquid poured out upon the ground. Those on the rim of a hole were helplessly shoved over and in by the crowd coming behind, and in turn were followed by those that pushed them in. Thus they piled up until wagon-loads of them accumulated. Each hole soon contained a wriggling squirming, angry mass of life that extinguished itself through the fierce fighting and mutual smothering of the individuals thus heaped upon one another.

The average daily life of an adult individual is about as follows: The first half of the morning is spent in feeding, in walking about, or in silent meditation. From about ten o'clock until noon mating takes place between the males and females. During this act the male is beneath the female. The former while courting the female chirps continually with his wings and, advancing backward and obliquely sideways toward the female from in front, tries to push his abdomen beneath hers. Sometimes the female makes no resentment but often the male has his patience sorely tried. One was observed for twenty minutes attempting to make a female accept him before she finally did so.

Although the male is the active party during courtship the fertilization of the female depends on an act of her own. The ovipositor is directed downward or its tip braced against the ground; the opening of the bursa copulatrix behind the eighth sternum is then brought against the tip of the male's abdomen. After about five minutes a large white mass of tough albuminous matter is ejected by the male

into the bursa copulatrix of the female. The pair then separates but the white mass hangs from the abdomen of the female as a large bilobed appendage and apparently causes her much annoyance.

It is not evident what the function of this albuminous mass is, but it looks like simply a plug to close the bursa copulatrix. In the male a great mass of tubular accessory glands open into the ejaculatory duct and it must be these glands that secrete the albuminous mass.* The female often keeps the tip of her abdomen elevated to prevent the mass from dragging on the ground, for, being sticky when fresh, it becomes covered with bits of leaves and grains of sand. She attempts to rid herself of it by bending her head beneath the abdomen and chewing it off. Others assist her by eating at it until after a short time it is gone. Seldom is one seen in the afternoon with the mass adhering while it is commonly present on females in the morning between ten and twelve o'clock. No cases of mating were ever observed in the afternoon.

Most of the afternoon is spent by the members of non-migratory bands in the same way as the early part of the morning. At about five o'clock, however, in both stationary and migratory bands, the females begin laying eggs and continue to do so until late in the evening. While ovipositing the female most commonly assumes an upright position, standing upon her hind legs beside a small bunch of grass and grasping the blades with the other legs for support (Fig. 3). The ovipositor is carefully forced down into the ground to its base. Strong peristaltic contractions of the abdomen now take place for a minute or so and then the ovipositor is withdrawn. Immediately, however, it is either poked down again into the same hole or thrust into a new place beside the first one. Thus the female continues placing a few eggs in one hole, a few in another and so on until a great many are laid about the roots of the same clump of grass. Often she quits one place and goes off some distance to another. In the migrating bands the females have much difficulty in depositing their eggs on account of the jostling and pushing of those moving past. Sometimes a female while ovipositing rests on the ground in the natural position and inserts the ovipositor by drawing the tip forward beneath her and then thrusting it downward into the ground.

The eggs are not inclosed in a case, each being entirely free and

* See Internal Anatomy of *Peranabrus scabricollis* by R. E. Snodgrass — Journal New York Entom. Soc., XI, p. 186, pl. XII, Fig. 8.

separate from the others. They are discharged from the tip of the ovipositor, passing slowly along its entire length, one at a time, by a slight movement of the blades upon one another. The latter spread apart at the tip as the eggs pass out.

After laying her eggs the female apparently weakens and dies during the day following. Early in the mornings there may be seen a great many weak or half dead females lying about or being devoured by the other members of the band. Nearly all the remnants of others that have been eaten during the morning are also of females, as is attested by the uneaten ovipositors.

About the middle of July, it is said, the crickets all die off, and this ends their history for the year. Toward the end of the season there must be a great preponderance of males, for the males were not observed to die off daily with the females. Nearly all males being eaten by others were injured individuals. In the migrating bands the next year's brood begins where the parent brood of the year before died off.

Only one natural enemy of the crickets was noted. This was a large black Pompilid, *Palmodes moris* Kohl., which during the season of 1902 inhabited in considerable numbers the outskirts of the Coulee City band. The wasps were seen everywhere flitting restlessly about amongst the crickets but no attacks on the latter were observed. One wasp was discovered in the act of dragging a female cricket over the ground to her burrow. The cricket was either dead or paralyzed to such a degree that it exhibited no sign of life and the wasp had her mandibles inserted into its head. On reaching the burrow the cricket was left outside for a few minutes while the wasp hurried below as if to see that all was properly prepared. She then came up and hauled the cricket down head foremost. Immediately afterwards she returned to the surface and flew away leaving the burrow uncovered.

Many wasps were seen filling the mouths of their burrows, but in only one such dug open was a cricket found. This was a female, with the head upward. During the summer of 1903 not a wasp was seen anywhere.

No destructive remedy has as yet been successfully applied to these crickets. Experiments made by Professor C. V. Piper on inoculating them with the South African grasshopper fungus were unsuccessful as have been all other attempts to introduce this disease. The insects could probably be killed by rolling, burning, or by turning loose

turkeys and hogs amongst them, and they would certainly eat poisoned meat, but all of these methods are impracticable.

The only successful method of combatting the moving bands is that of fencing and dilating. The fences as already described effectively stop their advance, but to fence in all of the country that it is possible for the crickets to travel into would be an expensive undertaking. A great many can be trapped in the ditches but a few score-wagon loads of dead crickets does not appreciably diminish the number of the living.

TWO INTERESTING MANTIDS FROM THE UNITED STATES.

BY A. N. CAUDELL,

WASHINGTON, D. C.

(PLATE III.)

Among the members of the order Orthoptera occurring in the southern part of the United States, making collecting in that region so interesting as well as profitable, are the two species herein considered. Both being rare, one hitherto unrecorded from our fauna, the following notes, with accompanying figures, need no excuse.

Brunneria borealis Scudder. (Plate III, Fig. 3.)

Brunneria borealis Scudd., Can. Ent., XXVIII, 212 (1896); Cat. Orth. U. S., 13 (1900).

This species was described from a female nymph from the Gulf Coast of Texas, but in the original description mention is made of an adult female in the museum of Comparative Zoölogy at Cambridge. These two specimens have been examined. Besides these two specimens I have seen two adult females in the collection of N. Banks, taken in Brazos county, Texas, and one adult female is in the National Museum from Louisiana, taken by J. B. Coleman at Cowley in October, 1903. This latter specimen is the one figured. The male seems to have never been reported. It will very surely have elytra and wings about two thirds as long as the abdomen, thus agreeing with the other known species of the genus.

These females are very closely allied to the South American species *brasiliensis*, but the supraanal plate is somewhat more elongate, meas-

uring 3 mm. in length, seemingly more nearly allied in this particular to *B. subaptera*.

The cerci of the specimen figured were unfortunately absent and the defect in the drawing was not noticed until too late for correction. They should project beyond the tip of the supraanal plate a distance about twice the length of the latter.

Vates townsendi Rehn. (Plate III, Figs. 1-2).

Vates sp. Rehn, Trans. Amer. Ent. Soc., XXII, 221 (1901).

Vates sp. Caud., Proc. Ent. Soc. Wash., V, 165 (1903).

Vates townsendi Rehn, Proc. U. S. Nat. Museum, XXVII, 573 (1904).

As indicated by the above bibliography, this handsome insect was twice recognized in the immature state before the adult was made known. The type specimens were taken by C. H. T. Townsend at Zapotlan, Jalisco, Mexico. Its first recognition from the United States was as a nymph from Arizona, but recently the U. S. National Museum has acquired by purchase from the collector, Mr. E. J. Osler, two mature males from Nogales, Arizona, collected on June 14 and July 18. These specimens are the ones here figured.

APLOPUS* MAYERI, NEW SPECIES.

BY A. N. CAUDELL,

WASHINGTON, D. C.

The Phasmid described and figured by the writer as *Haplopus evadne* of Westwood (Proc. U. S. Nat. Mus., xxvii, 950, 1904) is not that species, the male having been found to be brachypterous. A number of specimens of both sexes were taken in Florida, Dry Tortugas, Loggerhead Key, by Dr. A. G. Mayer. The specimen figured at the above reference is really a male and not a female as there stated. The restored tip of the abdomen however very well represents that of the true female as represented by specimens in the present collection. The female agrees in structure with the male except that the form is more robust and the pronotum and mesonotum are not so smooth and

* *Aplopus* was used prior to Gray's work by Megerle von Muehlfeld but seems to not have been used in a valid sense. Thus Gray's name is not invalidated by it. *Aplopus* being the original spelling, should be used, not the emendation *Haplopus* of Burmeister.

are more thickly spinose, the spines, however, smaller than those of the male. The antennæ of both sexes are about the length represented in the restoration in the figure; the basal segment quite strongly depressed, especially at the base, and considerably thicker than the succeeding ones, the entire antenna gradually tapering to a fine point. The elytra are generally tumid centrally. The males usually, but not always, have the abdominal segments laterally marked longitudinally with white and the margination of the elytra seems quite constant in that sex. As suggested in the former article, the chalky markings of the body are not constant. The end of the male abdomen is very moderately swollen, the seventh and eighth segments subequal, the ninth very slightly shorter, subquadrate, apically subtruncate, mesially very obscurely emarginate; the operculum reaching the apex of the eighth segment. The cerci are very stout, slightly recurved, cylindrical, bluntly terminated organs about as long as the ninth abdominal segment and directed backward, a little downward and scarcely inward. The intermediate and posterior femora of both sexes are usually armed for their entire length beneath on the median line with from five to seven black spines, the apical two moved forward to the anterior carina and opposite them, on the hinder margin, is a single small spine; all the femoræ have the geniculations spinose on both sides, those of the anterior pair the least developed. The anterior femora are armed below on the apical third with a couple of very small spines.

The measurements of a typical pair are as follows: Entire length male, 90 mm., female, including the oviscapt 125 mm.; antennæ, male, 53 mm., female, 45 mm.; mesonotum, male, 20 mm., female, 26 mm.; metanotum, male, 6 mm., female, 6 mm.; intermediary segment, male, 7 mm., female, 8 mm.; elytra, male, 7 mm., female, 8.5 mm.; anterior femora, male, 20 mm., female, 20 mm.; intermediate femora, male, 16 mm., female 17 mm.; posterior femora, male, 21 mm., female, 22 mm.; oviscapt, female, beyond the tip of the abdomen, 12 mm.; median width, mesonotum, male, 3 mm., female, 5.5 mm.; second abdominal segment, male, 2.75 mm., female, 5.5 mm.

Types in the Museum of the Brooklyn Institute of Arts and Sciences, Brooklyn N. Y., and cotypes in the National Museum, Washington, D. C.

In many particulars this species seems near *Aplopus micropterus* but the shorter wings and other less noticeable characters seem to separate them. It is also closely allied to *A. scabricollis* Gray, as

stated in a letter from Mr. W. F. Kirby, to whom specimens were submitted; but that is a larger species with a considerably longer oviscapt in the female. The location of this species in the genus *Aplopus* is merely tentative, the brachypterous males excluding it from this genus unless the male of *micropterus*, the type, is proved to be also brachypterous. In that case the species with macropterous males would necessarily take another generic name.

Class III, ARACHNIDA.

Order II, ARANEIDA.

CHANGE OF COLOR AND PROTECTIVE COLORATION IN A FLOWER-SPIDER. (*MISUMENA VATIA* THORELL).

BY ALPHEUS S. PACKARD, LL.D.,

PROVIDENCE, R. I.

My attention was called to this interesting subject in the summer of 1903, by observing the adaptation or "mimicry" of our common *Misumena vatia* Thorell (*Thomisus fartus* Hentz) to the hues of the petals of the daisy fleabane (*Erigeron annuus*) in blossom at Merepoint, Brunswick, Maine, July 18. It was then my impression that this spider was known to change its color, and I suppose that this took place within a short period—a few days at least—but on trying to find mention of such rapid or any other change of color I was unable to meet with any such notices. As for my own experience previous to last year I have only a vague recollection of seeing many years ago on a tree or flower a yellow *Misumena*. On inquiry of Mr. Nathan Banks, he very kindly called my attention to a brief note by James Angus in the American Naturalist, Vol. XVI, p. 1010, which says: "I suppose you know the little flower spiders, that conceal themselves in the flowers, and seize any unwary insect that may chance to come within their reach. I have generally found them white and yellow. I suspected they changed their color, and by experiment I find that this is so. If I take a white one and put it on a sunflower, it will get quite yellow in from two to three days. I believe they capture almost anything, but they seemed to be partial to the bees. I

found one the other day with a wasp; the latter was not yet dead, but it was tightly held by the throat by the spider. The next day the wasp was found lying dead under the flower." Mr. Banks also wrote me October 7, 1903, as follows:

"I do not remember that there has ever been published any positive evidence that *Misumena vatia* or the closely allied *Runcinia aleatoria* ever change their colors. Of both species yellow and white specimens are found sometimes marked with red. I think Miss Treat once published a note to the effect that *Misumena* when placed on a different flower returned to its former flower. There is a case on record (*Nature*, 13 April, 1893, p. 558) where a Mr. Bell states that an African bluish spider when captured turned brownish, and afterwards gradually recovered its bluish color, perhaps from fright!

"Personally, I believe *Misumena* changes color, at least from white to yellow. From old notes I take the following: Early in the spring where the principal large flowers are white *Trillium* (wake-robin) I have found many white *Misumena* with a red stripe; later, when the *Trilliums* were faded, there were many *Misumena* on the yellow dog-tooth violet; these were all yellow, with red stripe. On this area were no white flowers then, and no *Misumenas* to be seen except on the *Erythroniums*.

"This, of course, is no proof, but evidence. I don't see anything strange or rather new if they did change color. For the young *Misumena* is neither white nor yellow, and without red stripes. Yet from these almost hyaline young grow spiders, some white, some yellow, some with red stripes. Therefore it would seem that their color depends upon their surroundings. If these surroundings can develop a yellow from hyaline, why not yellow from white?

"I have seen *Misumenas* on flowers and plants with which their colors did not harmonize; and there is variation in the shade of yellow and in size of red stripes and, with *Runcinia*, in the number of these stripes."

On the 18th of July, 1903, I detected a medium sized *Misumena vatia* holding in its jaws a green fly (*Lucilia caesar*). It had fastened its jaws in between the head and thorax, and there remained motionless several minutes until I touched the tip of the fly's wing, the fly being dead, and disturbed the spider so that it let the fly drop to the ground.

The flower of this fleabane is like an aster, *i. e.*, with a bright yellow center and pale, whitish lilac petals. The abdomen of this spider was yellowish and the head, thorax and legs pale whitish, but not snow-white, and more livid than the petals of the flower when the spider was resting directly on top, but when the legs were held obliquely so that the light was oblique, the hue or effect was exactly like that of the petals, so that it was a decided case of cryptic or protective mimicry.

A couple of days after I found several more half grown spiders on the same kind of flower, one had seized a small fly by the neck. One was found on the ox-eye daisy or white weed; it sat on one side of

the yellow center, on the white petals; the fly alights on the flower, probes the yellow flowerets head-down, when it is seized by the neck and its blood is sucked; this spider and two others on the fleabane were all whitish, both cephalothorax and abdomen, the latter whiter than the cephalothorax and legs. No yellow ones were seen this season, but it did not occur to me to look for them on the golden rod.

I tried several experiments to see if these spiders would change colors. I enclosed one small one in a test tube on the red corolla of *Rudbeckia* for an hour, without any perceptible change, and again put six in the tube for a day without any change. Four of the *Misumena* were kept for four or five days in a bottle filled with wild rose leaves but no change was observed. They were fed with house flies and never appeared to see or notice the flies until the victim actually flew or ran directly into the jaws of the spider. Also in neither season did I find any reddish spiders on the wild rose.

The remaining observations were made at Merepoint, in July, August and September of 1904. On the 8th July of I found two on the buttercup; neither were yellow, but of the usual pale slightly greenish tint; a small one detected on the 12th was of a slight yellowish green. July 12 two decidedly white ones occurred on the buttercup, one with a red stripe on each side of the white abdomen. I placed two of them in a bottle filled with buttercup flowers, and kept them for three or four days without noticing any change of color. Four examples were collected from the ox-eye daisy, but none were yellow, one was whitish and the other greenish. One large one was yellowish green.

July 14 I put one in a box filled with heads of the ox-eye daisy, it was faint yellowish, while one in a test-tube with the same kind of flower is yellowish green. A rather large *M. vatia* was found with an *Andrena* bee 12 mm. long in its jaws.

I lined a glass bottle with tiger lily leaves and left a large white one with red lateral stripes in it for three or four days, but no change resulted.

After this, with the flowering of the golden rod, the prevalent color became yellow. The golden rods began to flower July 31, and on that day five small whitish ones with no yellow tinge were found on the freshly opened flowers. Four days after (August 4), when more *Solidago* flowers had opened six small spiders were picked off, and one half-grown spider all yellow, distinctly so, the cephalothorax and

abdomen above and beneath, and also the legs. This is the first yellow one I have seen for some years. The yellow hue is uniform, though the abdomen was a little deeper in hue than the rest of the body.

Two days later (August 6) the yellow ones had greatly increased in number with the blossoming of additional plants of the *Solidago*, for now ten yellow ones were found to one on the 4th.

The spiders were thoroughly well protected from observation, both by their pale yellow color, and by their habit of hiding among the greenish yellow calices of the flowers, not resting as a rule on top of flowers.

Was the change of color due to alteration of the pigment, or to color-preference? Had the yellow ones simply gathered on the newly opened golden rod and come from the yellow flowers? Evidently not, because there were no other abundant yellow flowers, the buttercup having mostly gone out of blossom, and the only other flowers on which they had been detected were the fleabane, ox-eye daisy, and wild rose, these being the commonest flowers at Merepoint.

During the latter part of August yellow ones prevailed on the golden rod. On the 12th I found three rather large yellow *M. vatia* on the golden rod, one large one striped on the side of the cephalothorax and abdomen. Only the young ones were whitish. It seems quite apparent that the yellow ones have more or less gradually changed, since they are not of the exact shade of yellow, the hues differing in intensity as if they had gradually become adapted to the change of color, and they are all yellow with a shade or tinge of green so that they are more in harmony with the general greenish yellow of the heads of the flowers among which they hide; as they are not, at first at least, of a uniform deep straw-yellow it is evidently a case of gradual adaptation, and not simple color preference, which assumes that the spiders were originally yellow and migrated to the *Solidago* from some other plants.

August 15 I found two small white ones on the golden rod and three or four yellow ones, and through the month middle and large-sized yellow ones occurred, with young colorless or whitish ones.

That they do change in consequence of adaptation to the yellow of the golden rod seems quite satisfactorily demonstrated by my beating from the golden rod, eighteen *M. vatia* into the umbrella, all of which were distinctly yellow, besides an additional small whitish one.

Afterwards at Intervale, N. H., on September 8 and 9, I found the yellow ones on *Solidago canadensis*, the most common species, and on *S. rugosa*, less common there, although this is the most common. Quite small yellow ones occurred, and at Providence several large deep uniform yellow ones.

Afterwards, on September 16, at Chocorua, five or six yellow *M. vatia* occurred on the golden rod (*S. rugosa*), one young *M. vatia* was yellow, the other greenish-yellow, all the young being distinctly yellow; one large example of a deep yellow. Not a single white half-grown or fully grown was seen.

September 17 in collecting I had the same experience as on the previous day; I found several young *M. vatia* which were yellowish and two large fully grown deep yellow ones, but no white ones occurred. On the red flowers of *Canna* occurred one full grown *M. vatia* with greenish cephalothorax and legs and a white abdomen. I beat the heads of a patch of life everlasting, comprising over 100 or 200 flowers, without finding a single spider on them, and none occurred in the few white and purple asters examined.

On reaching Providence, after considerable search I found but a single *M. vatia* on the golden rod, on the other hand *M. asperata* was the common species here, during the last week of September. Although the general effect is reddish, the ground color is pale yellowish; though in large ones the ground hue is often reddish. One yellowish one occurred on a small sunflower. It molted September 26. By the 4th or 5th of October, very few were seen, as they had apparently left the plants and gone into winter quarters.

At Chocorua yellow *M. asperata* occurred on the sunflower and also on a yellow gilly flower, or a similar plant.

Occurrence of a white M. vatia on a white golden rod. — At Intervale, N. H., I found two white ♀ *M. vatia* on the pale whitish golden rod (*S. bicolor*), and as stated above I found a white ♀ on the same species of golden rod at Providence. It was marked with red on the sides, as usual.

Occurrence of M. vatia on the sunflower. — At Intervale I found a large deep yellow spider of this species on the wild sunflower, *Helianthus decapetalus*.

Experimental proof of change of color. — On the 9th of August I enclosed two white *M. vatia* in a bag made of mosquito netting and tied over a head of the flowers of the golden rod. On the 15th on

opening the bag I found one which had grown larger, but still remained white, certainly not yellow.

August 20 I again opened the bag; the largest one was greenish white on the cephalothorax and legs, but the abdomen was pale yellowish; the smaller one had become yellowish all over, the body and legs distinctly yellowish, and the abdomen a little deeper yellow. This seemed a good test, and so far as a single experiment indicates, it shows that the change of color does occur in middle life, or when the spider is about half grown. The change evidently takes place in the pigment of the integument, as the result of exposure to yellow light reflected from the yellow flowers. In this way the spiders become adapted to their yellow environment.

The change requires certainly more than two or three days, *i. e.*, about a week or ten days. Thus on the 23d of August I placed a single white *M. vatia* found the day previous on the golden rod, in a bag containing a full head of yellow golden rods, and on opening it three days after (the 26th) it had not changed. On September 3 I opened the same bag and found the cast skin of the same white spider, the spider was not of full size, it was not distinctly yellow, being still whitish, with a greenish abdomen but slightly tinged with yellow. There was a dark green line on each side of the cephalothorax. Unfortunately the bag was not again opened, as I failed to return to Merepoint and was thus prevented from afterwards examining the specimen.

PREVIOUSLY PUBLISHED NOTES ON CHANGE OF COLOR IN FLOWER SPIDERS.

The foregoing observations were made and written out either before meeting with the published observations of others, or if read in former years they had been forgotten.

Besides the note published by Mr. Angus, Mrs. Mary Treat* states that *Thomisus celer* which lives in the heart of roses is nearly of the same shade of color as the red flower, and that when the spider is "waiting for prey she cuddles down in the center of the flower and erects her legs, when it is almost impossible to distinguish them from the imperfect scattering stamens." Mrs. Treat also observed a spider catch a butterfly, and adds that she had often noticed the remains of of night-flying moths scattered near her, which she had evidently captured during the night.

* My garden pets, Boston, 1887, p. 12.

That butterflies may occasionally be seized and destroyed by these voracious spiders is farther proved by Mr. Firmen* quoted by Mrs. Peckham. He once saw two butterflies "in the clutches of a spider," and on another occasion "witnessed the actual capture of a small blue butterfly (*Lycanestes*) by a white spider of the same genus" (*Thomisus*).

Returning to the subject of a change to rose-red, which I have not myself observed, Firmen mentions seeing at Cape Town a species "of the exact rose-red of the flowers of the oleander; and to more effectually conceal it, the palpi, tops of cephalothorax, and four lateral stripes on the abdomen, are white, according remarkably with the irregular white marking so frequent on the petals of *Nerium*."

Rev. O. P. Cambridge† has found *Thomisus onustus* pink when upon heather blossoms, and quotes Rev. C. W. Penny to the effect that it is yellow when upon yellow blossoms.

Prof. Edouard Heckel‡ has described and illustrated with two colored plates the color variations of *Thomisus onustus*—a species abundant in the south of France. This spider frequents the flowers of *Convolvulus arvensis*, and is so abundant during the months of August and September that nearly every plant has its spider; it is evident, therefore, that, in spite of the numerous insect visitors to these flowers, there must be a certain amount of competition for food among the spiders; this is especially the case if it be true that the spider limits itself almost exclusively to two Diptera, ignoring the other insects. The flowers of this *Convolvulus* show three varieties: one is pure white; another pink, with traces of a vinous red externally; while the third is a paler pink tinged with green externally. These three varieties of the *Convolvulus* are inhabited by three varieties of the *Thomisus* which correspond exactly in their hues with the flower, with the exception of the one which lives in the white flowers; this variety of spider has a blue cross on the abdomen, and the extremities of its legs are likewise bluish. Blue, however, may be suggestive of shadow, and not render the animal very conspicuous. These three varieties do not embrace all the colour modifications of which the spider is susceptible; it becomes a dark red when upon the flowers of *Dahlia versicolor*, which has a similar colour, and yellow when upon the flowers of the yellow *Antirrhinum majus*.

That I failed to find any bluish individuals is probably due to incomplete observations, since bluish individuals may yet occur in New England. That no pink ones occurred in the flowers of the wild rose examined may be due to the fact that those found by me may not have

* Protective resemblances and "Mimicry" in animals, p. 4.

† Spiders of Dorset.

‡ Bulletin Sc. France et Belgique, XXIII, 1891. Quoted from Beddard's Animal Coloration, p. 111.

been long enough exposed to the reflections of the roseate petals of this flower.

Beddard (Animal Coloration, p. 113) suggests that the yellow color of the *Thomisus onustus* is "not adaptation but simply due to age." It once occurred to me that this might be the case, but I think that the facts I have stated are more strongly in favor of a slow adaptive change, and it is disproved by the fact that old, fully grown white examples frequently occur throughout the last of the summer season.

Mr. Cook,* referring to what was probably *Misumena vatia*, quotes from an article by L. C. Palmer, "an intelligent observer, but not a naturalist," to the effect that he found a species of spider near Philadelphia which was purple on the purple boneset, pure white on the white panicle of the boneset proper, while on the golden rods it was yellow.

In Italy Pavesi "finds that this same species when living on flowers is white, or white and yellow with red stripes on the abdomen; but that when found among the grass it is grass-green, with dark, obscure stripes on the cephalothorax and palpi." (Quoted by Mrs. Peckham, l. c., p. 88.)

Mr. Emerton† found *M. asperata* perched on a flower of sorrel (*Rumex acetosella*), its colors being exactly those of the flowers. In "The Common Spiders of the United States" (1902) he states that the *Misumenas* live on plants, among the flowers, especially on large flat clusters like those of carrot and thoroughwort. "Whether," he says, "spiders prefer flowers colored like themselves is an unsettled question; at any rate *Misumenas* of all colors and both sexes have been found in white flowers. Occasionally individuals are found on flowers of exactly the same color as themselves; for example, deep yellow *M. aleatoria* on the wild indigo *Baptisia tinctoria*, and the reddish *M. asperata* on the flowers of sorrel."

The probable cause of the change of color. — The change of color in the flower spiders appears to be due primarily to the direct action of the sun's light, and secondarily to the absorption of the color light-rays by the pigment of the integument. That it is obviously in no way the result of the food is evident, because these spiders feed upon the colorless blood of insects. We know nothing of the immediate cause of such changes, which occur during the life-time of the indi-

* American spiders and their spinning work, II, p. 368, 1890.

† Spiders of the family Thomisidæ, Trans. Conn. Acad., VIII, 1892, p. 370.

vidual, and are not transmitted to the offspring, beyond the fact that they are due to differences in the colorational environment, *i. e.*, the white, or yellow or pink hues of the flowers in which the spider hides or on which it rests.

The explanation of the cause must be sought in what we regard as a parallel case in the experiments initiated by T. W. Wood* in 1867, and greatly extended by Professor Poulton,* as described in his able essay "On the color relations between certain lepidopterous pupæ, and the variously colored surfaces immediately surrounding them." Mr. Wood found as the result of his experiment that "the skin of the pupa for a few hours after the caterpillar's skin has been shed is 'photographically sensitive,' " and "as might be expected, by putting the specimens in the sunshine at the time of changing, and surrounding them as much as possible with any desired colour, the most successful results have been obtained."

Professor Meldola has pointed out, says Poulton, that the theory of the moist, fresh, pupal surface as "photographically sensitive" was obviously a metaphor borrowed from the sensitive plate of photography and that there can be no real analogy between the two processes. Poulton concludes that the problem is essentially a physiological one, and that the physico-chemical changes are "merely the results of far more complicated physiological processes."

The question arises whether the change in *M. vatia* is connected with the molting period, but I have no observations which directly prove this. It is well known that many spiders with nearly each molt appear in different colors, or undergo some change in the markings.

Summary of Results of My Own Observations.

1. In the early part of the summer (June and July) when the greater mass of flowers are the white fleabane and the ox-eye (the wild rose and buttercups excepted) the spiders (*M. vatia*) are white and no yellow ones were detected.

2. Later in the season, towards the end of July (July 30-31), and early in August when the golden rod in Maine begins to flower, a few of the spiders are yellow, but by the middle of the month and through September they are almost without exception yellow, varying from a pale to a deep hue, probably due to the length of time they have been

* Trans. Ent. Soc. London, 1867, p. XCIX-CI.

† Philosophical Trans. Royal Soc. London, vol. 178, 1887, p. 311.

on or among the yellow flowers; an occasional white one occurring which may have been a recent arrival from some bush or other plant.

This is an exact parallel with the instance observed by Mr. Banks, when the spiders occurring early in the spring in Virginia on the white trillium, afterwards become yellow on the yellow flowers of the dog-tooth violet, there being no white flowers in the neighborhood.

3. By enclosing a couple in a bag tied over a golden rod they have actually been found to change from white to yellow in the course of ten or eleven days.

4. There is an actual change in color, and the assembling of yellow spiders on yellow flowers is not a case of color-preference, but of a gradual alteration in the color of the pigment of the integument. Whether as in the case of lepidoptera, the change takes place at or directly after the time of molting has yet to be ascertained. I have no observations directly bearing on this question.

5. In rare cases (3) white *M. vatia* were collected on the white *Solidago bicolor*.

6. No *M. vatia* or any other species of Thomisidæ were found on blue or white asters or on life everlasting, of which hundreds were examined.

7. The result of the coloring, while in harmony with the color environment, is certainly not to protect the spider from the attacks of birds, as the only kind of spider-eating bird is the humming bird, other kinds of birds, as investigation shows, not feeding on spiders. On the other hand, the coloration is so far cryptic that flies and other prey of the spider less easily observe its presence. This, however, is quite a subsidiary matter; without reference, so to speak, to the biological environment, the main fact is that the color of the spider is the mechanical result of exposure to an environment of this or that color.

8. The cause of the change of color is simply the action of light, and in the case, for example, of yellow individuals, to the reflection of yellow light from yellow flowers continued for a period of exposure varying from several days (three or four) to one or more weeks. There are multitudes of similar cases in other groups of animals, and protective coloration so-called is simply the mechanical result of the operation of a primary physical agent, *i. e.*, light.

The colorational change is not due to natural selection or to the survival of some one or even several fittest individuals, since hundreds

of thousands or great multitudes of individual spiders living on the golden rods of a vast area extending over northeastern America appear to become similarly affected when the golden rods come into flower.

In this case the color is not necessarily hereditary, since the young spiders are at first colorless, and when older whitish. The yellow hue persists only as long as the flowers are in blossom. Thus the yellow color variety persists only as long as the colorational environment is the same. Hence the natural selection theory seems quite inadequate and also unnecessary to account for the apparent mimicry, and the change of color is a clear case of adaptation to a color-environment, and is an example of Lamarckism, or what Eimer and others call orthogenesis.

Since this paper was sent for publication, we have read Keeble and Gamble's elaborate memoir on the color physiology of the higher Crustacea which fully confirms our view that color changes are primarily due to light and environmental changes. The change of color in the flower spiders seems to be an example of what Pouchet calls the "chromatic function." He experimented by placing shrimps (*Palæmon* and *Crangon*) in black and white dishes in broad daylight. On the black background the pigment cells expanded, and the resultant coloration was a dark one in harmony with the tone of the surroundings. On the white background they contracted, and the consequent colorless place presented no contrast to the adjacent surfaces. Pouchet claims that the pigment movements were due to the stimulus of light, electricity and certain drugs, and he concluded that the background or color of the environment determined the movements of the chromatophores or pigment cells, through the mediation of the eye and nervous system.

His results have been confirmed and extended by Keeble and Gamble* in their recent work, from which we have taken the above abstract of Pouchet's results. They also record that Jourdain (1878) pointed out that in addition to light, electrical and pharmacological stimuli, the temperature of the water influenced the color of sensitive crustacea, and that such changes were naturally independent of the action of the retina. Keeble and Gamble have shown (1900) that "rapid movements in the chromatophore could be induced by any decided stimulation; that slow changes followed the application of

* Phil. Trans. Roy. Soc. London, vol. 196, pp. 295-388. 1904.

less powerful stimuli, such, for example, as differently colored backgrounds in place of strongly contrasted ones; and that underlying these quick and slow reactions of the chromatophores to changes of environment, there was at least one intrinsic chromatophoric rhythm, the after effect of alternating night and day."

They confirm the view that light sets up movements of the pigments by its direct action on the chromatophores. "Light exerts a potent and varied influence on the littoral crustacea. Such animals as *Hippolyte*, *Mysis*, and *Palæmon*, instead of becoming inured, remain highly susceptible to the ever-changing light conditions of their environment." It also plays an important part in controlling not only the movements of these animals, but also the distribution of their pigments. The factors in pigment-movements are intensity, background or environment, and monochromatic light.

The color-phases in shrimps depend on different light conditions. In darkness the pigments of *Palæmon*, etc., are so contracted into their chromatophore-centers, that the latter appear as minute dots, resulting in a transparent phase. The rapidity with which the change takes place varies from ten or a less number of minutes to an hour or two.

What the authors call the "white background phase," *i. e.*, a transparent condition, the pigments being freely contracted, may be and generally is assumed with great rapidity, less than a minute often sufficing to call it forth in *Hippolyte* or *Macromysis flexuosa*. Here we might add that Pouchet found that in the turbot under certain conditions the color changes are only developed after a period of several days. Very pertinent to the matter of change of color in spiders and insects are the author's conclusions as to the environmental or background effects on littoral crustacea. "The background effects on pigment-movements, help us," they say, "to imagine how light modifies pigment-development and thus causes such an animal as *Hippolyte* to 'give into' its surroundings, modelling its diurnal pigment distribution on the distribution of light and shade on its background." They add: "As long as its background is unchanged, change of intensity avails little. Now of all things which characterize *Hippolyte* its tenacious immobility on the weed of its choice is the most striking."

JOURNAL

OF THE

New York Entomological Society.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

EDITORIAL.

In the December issue (Vol. xii, p. 254) the figure labelled to represent *Caddo glaucopis* should be transferred to *C. boopis*, as Mr. Crosby has informed us.

Contributors to the Journal will please take notice that they can have separates of their articles printed in any number and in any form at cost, by notifying the editor sufficiently in advance. The publication committee has found it necessary to discontinue the sending out of reprints free of other matter, as was done with volume xii. Authors who do not notify otherwise, "shall be entitled to 25 copies" and will usually receive 50, without change of form, which means that there will generally be some foreign matter at the ends.

The scope of P. Wytsman's "Genera Insectorum" is, in the portion on Lepidoptera, much the same as Hampson's "Catalogue Lepidoptera Phalaenae," but the treatment of species is far less complete and satisfactory. It includes the butterflies, as Hampson does not. If the subject were to be pushed energetically, it would result in a practical duplication of Hampson's work, which we think would be a waste of effort. An advantage would accrue to the student if the families to be first treated were those which Hampson will reach last, and at the present rate of publication, not reach for many years, namely, the Tineoid groups. However, there has been no evidence till lately of any intention to push the subject energetically. We have had before us some small fascicles in which several authors have treated of sundry of the smallest groups they could find; the Liby-

theidae by Pagenstecher, the Epicopiidae by Janet and Wytsman, the species or varieties of *Leptocircus* by Wytsman and the *Ornithoptera* by Rippon. These papers are too short to require serious comment, except that we would blame the editor for allowing such a characterization of a synoptic table as that of the *Ornithoptera* genera to get into print. Mr. Rippon has evidently not the faintest idea of how a table ought to be constructed, and, until he will take lessons in the rudiments of entomological carpentry, his large knowledge of and great interest in the most beautiful of all the butterflies will be prejudiced in the eyes of his fellow workers.

Finally we come to the first serious publication, the Hesperiidæ, by P. Mabille, covering 210 pages. The treatment seems both thoroughly advanced and conservative, although badly hampered in places by lack of material. For example, some of the American genera of the subfamily Pamphilinæ, section B, are given in a separate synoptic table, as the author had not the material to properly correlate them with the rest. The index is given in an excellent form but is incomprehensibly divided in two parts and it has a number of omissions. The treatment of the North American species is disappointing. Seventy-five out of our nominal two hundred species are entirely omitted. We are at a loss to imagine any adequate reason for this, as the author includes several lists of "species incertæ sedis" and we should look for our missing species there if the author had been unable to recognize them. It looks like a failure to properly study the literature. We hope to be able to return to this subject and assign these seventy-five species to their proper genera. We are sorry to note some inconsistencies in the synoptic tables. For example, in the table on pages 14 to 18, we find (under 7) "Pas de pli costal," which leads us finally to 27 where we read: "un pli costal chez le ♂." . . . Genus *Cocceius* G. & S." How is one to use this table? If *Cocceius* has a costal fold, it should come in the section with a costal fold, where it would apparently fall next to *Plestia* Mab. Again under 33 is the second alternative "Pas de pinceau semblable" (*i. e.*, Pas de pinceau de poils couchés sur le dessus ou le dessous des ailes inférieures), which leads us to 40, where is "Un pinceau de poils couchés dans le pli abdominal . . . Genus *Pyrrhopygopsis* G. & S." The genus *Orneates* G. & S. is in the table twice, while *Murgaria* Wats., *Euschemon* MacL., *Mionectes* Mab. and *Marela* Mab. are entirely omitted therefrom.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF OCTOBER 4, 1904 (continued from page 52).

Mr. Leng exhibited about 200 species of beetles collected in Newfoundland by Mr. W. S. Genung in July, August and September. About half the species belonged to the family Carabidæ and among those of special interest were *Cychrus brevoorti*, and *Carabus maeander*. The leaf and flower beetles, Chrysomelidæ and Coccinellidæ were represented by only a few species.

Mr. Genung, who was present as a visitor, then described his journey in Newfoundland. After spending a week in Cape Breton, he visited successively Bay St. George and Bay of Islands on the west coast; Lewisport on the east coast and Whitbourne and St. Johns in the peninsula of Avalon. A mountain range about 2,000 feet high bounds the west coast, in the ravines of which the snow does not melt; the soil is poor and the climate cool and windy even in midsummer. Throughout the railway line in the interior of the island extensive forest fires made collecting impossible. Along the east coast and especially in Avalon the conditions are more favorable for animal life and there the population principally centers. Mr. Genung spoke of the caribou which migrate annually from north to south; of the grouse and other shooting; of the fishing and general attractions of the island to sportsmen. He also mentioned the black-flies which abound in July about wet places, the sphagnum moss swamps, rivers and ponds with which the island is abundantly provided. He also described the localities in which the rarer Carabidæ were found, deep dark ravines continuously moist all the season through and spoke of the habits of these insects.

Mr. C. Schaeffer, under "Notes on a New Phasmid," remarked that in the Proceedings of the U. S. National Museum, a few months ago, Mr. A. N. Caudell published a note on the occurrence of the phasmid *Haplopus evadne* Westw. in Dry Tortugas, Florida. The specimens, one adult and one nymph, were collected by Dr. A. G. Mayer and are in the collection of the Brooklyn Museum, the adult specimen being in poor condition, lacking the last three abdominal segments and the antennæ, was considered by Mr. Caudell to be the female of *Haplopus evadne*, of which only the male was known, and gave a description of this supposed female. Very recently Dr. A. G. Mayer, now Director in charge of the Marine Biological Laboratory of the Carnegie Institute in Dry Tortugas, placed in the hands of Mr. Schaeffer a number of these phasמידs preserved in alcohol. Most of the specimens were adults and represented both sexes. From an examination of this material it became evident that the supposed female described by Mr. Caudell is the male and that both sexes have aborted wings. The male *Haplopus evadne* is described as having long wings and it is possible that this phasמיד is a new species. All of our Phasמידæ thus far recorded are entirely wingless and the addition of this Florida species is of great interest. There is also a nymph of this species in the collection of the Brooklyn Museum, taken last year by Mr. Gustav Beyer, at Key West, Florida. Dr. Mayer, who collected the specimens at Mr. Schaeffer's request, informed him that the phasמיד occurs in bay cedar bushes.

Mr. Wm. T. Davis, under "Note on the occurrence of *Leptura cruenta*," stated that Professor Smith in his "List of New Jersey Insects" records that a dead speci-

men of *Leptura cruenta* Hald. was taken by Mr. Charles Liebeck at Da Costa, Atlantic County, New Jersey. Mr. Joutel and himself, while collecting at Hewitt, New Jersey, on the 19th of last June, were fortunate to find a specimen of this rare longicorn on the flowers of the low growing dog-wood *Cornus canadensis*. A few days previously Mr. Joutel had collected a specimen at Hastings-on-the-Hudson in New York State.

This species is not mentioned in either the Buffalo, Cincinnati or Washington Lists of Coleoptera. Mr. Leng has given its distribution as follows: Pennsylvania, Georgia, Texas, Canada and western.

Mr. Harris reported the localities he had visited in the search for Cicindelidae. Among the places mentioned were southern Delaware, Popenoe Mts. in West Virginia, Burlington, Vt., Peekskill, N. Y., and in all of these localities results were poor in any but the more common species. He found better collecting in the Adirondack Mts. early in August, where he took eight specimens of *C. longilabris* on top of Jay Mts. From the 10th to the 21st of September he collected along the south shore of Long Island, taking many large specimens of *C. rugifrons*, one *C. consantanea*, one *C. generosa*, several *C. repanda*, sixty-three *C. purpurea*, and a number of fine specimens of *C. vulgaris*.

Discussion as to whether *C. rugifrons* occurs along beaten roads or in grass patches, participated in by Messrs. Weeks, Joutel and Schaeffer.

Mr. Bueno stated that he had collected several weeks at Westfield, N. J., and found poor results from sweeping, but water-bug collecting was good.

Mr. Joutel exhibited a peculiar egg cocoon of a spider which resembled the receptacle and calyx of a flower after the petals had fallen off.

Mr. Leng under "Remarks on *Cychnus*," stated that in his opinion many of the so-called species were not specifically different, but really represented one species occurring in different localities under different conditions. These were entitled to race names rather than specific names. He spoke of *C. elevatus* and *C. viduus* as an instance in point.

Mr. Weeks stated that contrary to report he had not observed that *Colias philodice* was being replaced in this vicinity by *Pieris rapa*.

MEETING OF OCTOBER 18, 1904.

Held at the American Museum of Natural History. Vice-President C. W. Leng presided with nine members and one visitor present.

On motion of Mr. Groth, Mr. William Wood was elected an active member of the society.

The question of holding but one meeting monthly was raised and the discussion was participated in by nearly all of those present. The consensus of opinion being opposed to the suggestion.

On motion of Mr. Bueno the question was laid on the table until the first meeting in October, 1905.

Mr. Barber under the subject of "Preliminary List of Pentatomidae collected in Brownsville, Texas, by Mr. C. Schaeffer" gave a few notes on the distribution of the species collected from that locality and exhibited the collections of thirty-one species. Of these five are new to the United States and one a new species.

Mr. Schaeffer called attention to the synonymical notes on *Exochomus margini-*

pennisi and *Bramus septentrionis* by J. Weise and stated that if this was correct *Exochomus childreni* has also to be added as a color variation to *E. marginipennis* as he possessed a complete series from Missouri showing all of the intermediate forms from *E. childreni* to *E. marginipennis*. Mr. Schaeffer said that in his opinion there was a mistake in Weise's synonymy to which he would refer later.

Mr. Leng exhibited specimens of Coccinellidæ collected in Newfoundland and Cape Breton by Mr. W. S. Genung, also specimens collected on Mt. Katahdin, Maine, by Mr. H. G. Barber, in the White Mountains by Mrs. Annie Trumbull Slosson, and in the Adirondack Mountains by himself. Some of these species are found in all these northern localities and most of the species are not found in the vicinity of New York. The disparity between the apparently common northern species and ours seems striking and greater than prevails in other families.

Mr. Bueno exhibited some peculiar Aradidæ from Costa Rica.

MEETING OF NOVEMBER 1, 1904.

Held at the American Museum of Natural History. Vice-president C. W. Leng presided with ten members present.

On motion the society voted to dispense with the regular order of business and proceed at once to scientific discussion.

Mr. Barber presented a few remarks on the Genus *Cosmopepla* of the Pentatomidæ and exhibited specimens of all of the species occurring within the limits of the United States.

Mr. Watson exhibited a jar of barley infested by a little brown beetle (*Tribolium ferrugineum* Fabr.). From the same jar of barley he had previously bred a number of specimens of a micro-lepidopteron.

Mr. Southwick exhibited his collection of Cicindelidæ among which were some interesting varieties.

Mr. Davis remarked that he wished to record that he had found *Cicindela lepida* occurring quite abundantly at Machiponix, N. J., in the same neighborhood where the beach plum was growing.

Mr. Bueno exhibited specimens of *Plæa striola* and *Amorgius calosomum* to show two extremes in size among the aquatic hemiptera.

Mr. Joutel read a letter from Dr. R. E. Kunze, of Phoenix, Arizona, in which was given a detailed account of some of his summer's experiences in insect collecting.

Mr. Davis exhibited a specimen of the marshmallow and specimens of bumble bees covered with the pollen of this flower.

MEETING OF NOVEMBER 15, 1904.

Held at the American Museum of Natural History. Vice-President C. W. Leng presided with ten members in attendance.

On motion of Mr. Joutel the matter of printing on the back cover of the Journal, a list of the important saleable papers was referred to the librarian and treasurer.

Mr. Leng asked for a discussion of the suggestion of Dr. Dyar that the printing of the proceedings of the society be discontinued in the Journal. The question was freely discussed and unfavorably considered by all of those present.

On motion of Mr. Joutel the society voted to contribute \$25 from the society fund to the Journal fund.

Mr. Davis read a paper entitled "Notes on the Thread-legged Bug (*Emesa longipes*).". He stated that while stopping at Sommerville, N. J., last August he and Mr. Leng had found this insect in abundance under the roof of the piazza. In the same situations were the webs of many spiders from which the *Emesa* probably obtained many captured insects. Their powers of flight seemed very limited as one disturbed individual flew only about four feet to the floor. Mr. Davis remarked that he had kept individuals alive for a period of two or three weeks, when they fed upon flies. The insect is nocturnal and during the day remains inactive. He also remarked on the odor which he said was very faint in some and in others unnoticeable. In walking, the *Emesa* does not usually use the raptorial fore legs. He exhibited several adult specimens and one egg of which he gave a description remarking that according to Uhler the egg laying habits are unknown.

Mr. Bueno, under the subject of "Notes on *Hydrometra martini* Kirk. (= *lineata* Say), gave briefly the generic and specific synonymy, and mentioned Kirkaldy's and Martini's details of same. This species was taken by Mr. Davis and himself in Staten Island in May of this and last year. Its manner of progression was touched upon, as well as its habits of lying on the surface of the water and approaching its prey, which consists of living or dead insects. He gave the period of development from the egg to the adult as 25 to 35 days, allowing for from three to five broods in the course of the summer. Just after reaching maturity the insect is covered with a grayish pruinosity. It is long-lived and tenacious of life. He also referred to Say's variety *australis*, which, from the differences it presents in the terminal abdominal segments, leads him to the belief that it is a distinct species.

Mr. C. Schaeffer presented "Some Notes on Brenthidæ." On rearranging his material in this family he found among the unmounted Texas material of the Dietz collection a Brenthid which is apparently new. The species is allied to the Mexican, *Heterobrenthus distans* Shop. from which it differs in the pubescence of the outer antennal joints, the strong punctures at sides of each elytron and the different maculation. The antennæ being destitute of stiff hairs is one of the characters included in the generic description which does not fit the new species but as all other characters agree he preferred to put it in this genus. The other two species added to our list since Dr. Horn's paper, are *Vasseletia vasseleti* from Lower California and *Trachelinus uncimanus* from the Florida Keys, the latter only recently reported by Mr. Gustav Beyer in the Journal. The separation of the females of the two species of *Brenthus* have always caused some trouble, but besides the femoral teeth, the form of the second interstice is a very good character to separate the females of the two species. Mr. Schaeffer also stated that he had prepared a short synopsis of the Brenthidæ to be published in the Journal. In preparing the synoptic table of the genera he had met with considerable difficulty as the classification of the family is very unsatisfactory and based on the male characters alone, therefore the characters used will only apply to the forms occurring in the United States.

H. G. BARBER,
Secretary.

JOURNAL

OF THE

New York Entomological Society.

Vol. XIII.

SEPTEMBER, 1905.

No. 3

Class I, HEXAPODA.

Order II, COLEOPTERA.

THE DISTINCTIVE CHARACTERS OF THE EAST-ERN SPECIES OF THE GENERA DYTISCUS AND CYBISTER.

By C. H. ROBERTS, Sc.D.,
NEW YORK, N. Y.

All the species of the genus *Dytiscus* are of large size, the upper surface of dark color with a yellow stripe along the side of the thorax and elytra; the clypeus is yellow, and there is on the middle of the head an angular yellow mark; in addition to these yellow marks some species have the anterior and posterior margins of the thorax yellow, and the eyes margined with yellow. The color of the under surface is either pitchy black or yellow, or is intermediate between the two, or a mixture of them.

The form is comparatively little convex, always elongate, but of variable width.

The clypeus is always separated from the head by a suture visible across the whole width of the head. This entire clypeal suture, so far as has been observed, exists only in this genus and in the European genus *Meladema* in the Dytiscidæ, although it occurs in *Pelobius* and *Amphizoa*, and is common in the Carabidæ. The prothorax is destitute of a lateral margin. The prosternal process is of variable length, rather elongate and narrow, distinctly margined at the sides and is received into a groove of the metasternum.

The hind legs are but little developed for swimming being long

and rather slender. Their tibiae are usually about three times as long as broad; the tarsi are considerably longer than the tibiae and are terminated by two rather slender, curved, nearly equal claws. In the more perfect species, as *hybridus*, the swimming legs have become shorter and thicker and their claws more unequal.

The hind coxæ are rather small and the wings of the metasternum of moderate area; the coxal notch is elongate, and beyond it the coxal processes tend, in numerous species, to lengthen and become slender, so as to form two spinous projections in the extreme cases.

The anterior tarsi of the male are very highly developed; the three basal joints are very much dilated and form a nearly circular saucer, fringed at the edges beneath with elongate hairs, and bearing on their under surface two large palettes at the base, and elsewhere a dense pubescence—each hair bearing a minute palette at its extremity; the fourth and fifth joints are not dilated, the latter elongate.

The middle tarsi of the male have the three basal joints dilated and elongated, the three together assuming a narrow, parallel form, and are densely clothed beneath with a glandular or spongy pubescence.

In many species the females are dimorphic, one form being nearly similar to the male in sculpture, while the other bears deep elongate grooves on the elytra.

The species of *Dytiscus* inhabit the northern parts of the new and old worlds, and Persia and Japan have each one peculiar species.

The species of *Cybister* are also of large size and there are numerous species scattered over the whole world. They differ from *Dytiscus* in that the males have only a single claw on the hind tarsus; the females also usually have only one, and in certain cases a rudimentary second on the underside at the inner edge of the larger one. The prosternum is not channelled.

We have but one eastern species.

Dr. D. Sharp has separated *Dytiscus* into four groups as follows:

Group I.—Labrum distinctly emarginate in middle; apices of coxal processes *not* spinose. Into this groups fall our species *fasciventris*, *hybridus*, *verticalis*, *marginicollis*, *sublimbatus* and *marginalis*. Of these we have in the East *fasciventris*, *hybridus*, *verticalis* and perhaps *marginalis*.

Group II.—Labrum distinctly emarginate in middle; apices of coxal processes acutely spinose. Into this group fall *circumcinctus*, *parvulus*, *vexatus* and *dauricus*.

Of these we have in the east *dauricus* only.

Group III.—Labrum truncate in middle; apices of coxal processes acutely spinose; margins of elytra dilated. America is not represented in this group, the one species being from northern Europe.

Group IV.—Labrum nearly truncate in middle; apices of coxal processes obtuse; margins of elytra nearly simple.

Represented by one species, *harrisii*, which is found here in the East.

Of *Cybister* we have one species here, *fimbriolatus*, easily separated from *Dytiscus* by the generic characters and by its general form, which, instead of being regularly ovate, is more or less wedge-shaped on account of its being quite rapidly narrowed from base of thorax to head, and gradually broadened from base of thorax to one third from apex of elytra.

Having eliminated *Cybister fimbriolatus*, the only eastern *Cybister*, this leaves us with six species of *Dytiscus* to differentiate, namely: *fasciventris*, *hybridus*, *verticalis*, *marginalis*, *dauricus* and *harrisii*. At a casual glance the three most likely to be confused are *verticalis*, *dauricus* and *harrisii*, as all are of large size and similar form.

We can easily distinguish *verticalis* from the other two by the absence of a yellow apical and basal thoracic margin, and we can at once separate *dauricus* from *harrisii* by the form of the coxal processes. In *harrisii* they are rounded and blunt, in *dauricus* produced into a sharp spine. There is also the group character in the shape of the clypeus—*dauricus* distinctly emarginate; *harrisii* nearly truncate or scarcely at all emarginate.

The only other species likely to be confused with these is *marginalis*, but it is smaller than the other three and the group characters will separate it, it combining half of each, but agreeing with neither. The labrum being distinctly emarginate distinguishes it from *harrisii* and the coxal processes being rounded, not acutely spinose, separates it from *dauricus*, thus throwing it into the first group with *verticalis*, *hybridus* and *fasciventris*.

From the other three in group I, *marginalis* can be distinguished by the yellow thoracic markings. *Fasciventris* has scarcely a trace, or none at all, of a basal or apical yellow margin, and *verticalis* has none at all; *hybridus* has a fine linear yellow line at base and a fairly distinct margin in same color at apex, while in *marginalis* the basal yellow margin is distinct all the way across and specially broad in its middle portion.

Taking up the three species left in group I, *verticalis*, *hybridus* and *fasciventris*, we can at once separate *verticalis* by its very large size and a subapical yellow line on the elytra running out as a sort of spur from the marginal band near the apical angle and continuing nearly to the suture. Neither *hybridus* nor *fasciventris* has this line.

To separate the two remaining species is very simple, both male and female having very distinct characters.

In the males of *fasciventris* the middle tarsi have the three dilated joints formed into one compact, parallel, spongy cushion, while in *hybridus* this cushion is distinctly divided longitudinally by a glabrous space.

In *fasciventris* the female has the elytra *always* sulcate while in *hybridus* they are *always*, as in the male, smooth.

There are other distinct and interesting characters by which to separate the various species, but I have tried to bring to notice those most readily observed.

The division of the dilated joints of the middle tarsi in the male of *hybridus* by a glabrous space, as mentioned, at once distinguishes it from any other species of *Dytiscus*.

We can summarize the distinctive characters as follows:

D. fasciventris. — Labrum distinctly emarginate; coxal processes rounded, not produced; basal and apical thoracic yellow markings absent, or a mere trace; dilated joints of middle tarsi of male forming one compact, parallel, spongy cushion; females always sulcate.

D. hybridus. — Labrum distinctly emarginate; coxal processes rounded; a fine, linear yellow line at base of thorax and a fairly distinct margin in same color at apex; dilated joints of middle tarsi in male separated beneath longitudinally by a glabrous space. Females always smooth.

D. verticalis. — Labrum distinctly emarginate; coxal processes rounded, not produced; no trace of basal and apical yellow thoracic margins; a yellow subapical line on the elytra starting from the marginal band and nearly attaining the suture. Females smooth.

D. marginalis. — Labrum distinctly emarginate; coxal processes rounded; thorax with a distinct apical and basal yellow margin, the basal one being broader in its middle portion. Females dimorphic.

D. dauricus. — Labrum distinctly emarginate; coxal processes produced, distinctly spinose; thorax at base, apex and sides broadly bordered with yellow. Females dimorphic.

D. harrisii. — Labrum nearly truncate in middle; coxal processes not produced, blunt; thorax at base, apex and sides broadly bordered with yellow. Females dimorphic.

Cybister fimbriolatus. — Distinguished by its wedge-like, instead of regularly oval shape and the generic characters.

Class I, HEXAPODA.

Order IV, DIPTERA.

BRIEF NOTES ON MOSQUITOES.

By HARRISON G. DYAR, A.M., PH.D.,

WASHINGTON, D. C.

DISTRIBUTION OF *THEOBALDIA ABSOBRINUS* FELT. — In reëxamining my series of *Theobaldia incidens* from British Columbia (Proc. ent. soc. Wash., vi, 38, 1904), I find it to contain a mixture of a second species which I am able to identify with *T. absobrinus* Felt, both by the larvæ and male genitalia of the adults. This greatly extends the known distribution of this form which was described from northern New York.

IDENTITY OF *CULEX CONSOBRINUS* DESV. — We have examined material collected by Mr. August Busck in St. Louis, Missouri, which Mr. Coquillett considers to be *C. consobrinus*, and recognize it as *C. magnipennis* Felt. It is altogether probable that *magnipennis* is a synonym of *consobrinus*, as we know of but the one larval form and the male genitalia of Mr. Busck's specimens agree exactly with Dr. Felt's figure. Dr. Felt did not know *consobrinus* in describing *magnipennis*. The species will find place in the genus *Theobaldia*, or rather *Culiseta* since *Theobaldia* is preoccupied by *Theobaldius* Nevill, as Mr. Cockerell has pointed out to me.

EXCLUSION OF THE NAME "*CULEX REPTANS*." — Linnæus described a *Culex reptans*, which is not a mosquito, but, on the principle of "once a synonym, always a synonym" the use of the name is precluded in any other sense. The name "*Culex reptans* Meig." must therefore cease to be used.

HIBERNATION OF THE HOLLOW TREE SPECIES. — Of the two spe-

cies of mosquitoes whose larvæ normally live in the water in hollow trees, *Pneumaculex signifer* Coq. and *Grabhamia triseriata* Say, I have shown that the latter hibernate in the egg state. The former, it now appears, hibernate in the larval state. Mr. Busck brought a number of *P. signifer* larvæ from St. Louis in the Fall and they showed no disposition to transform. The two predaceous species of the hollow trees, *Anopheles barberi* Coq. and *Megarhinus portoricensis* von Rod. likewise hibernate as larvæ. I have observed this in the case of the *Anopheles* formerly and Mr. Busck's *Megarhinus*, brought with the *Pneumaculex*, has lived all winter in the laboratory. It would appear as if the *Pneumaculex*, must suffer more from the predaceous habits of the other species than the *Grabhamia* does, since it is longer coexistent with them in the larval state.

RELATIONSHIP OF CULEX INCONSPICUUS GROSSBECK. — The figures of fragments of the larva of this species given on page 297 of Smith's Report on Mosquitoes (1905) show it to be allied to the species described by Felt and Young as *Culex lazarensis*. However, the male genitalia of *inconspicuus* as figured differ from those of *lazarensis* as figured even to a generic degree. *Inconspicuus* falls in *Culicelsa* while *lazarensis* belongs to *Grabhamia*. This looks like a disagreement between larval and genitalic characters which is unusual, and may indicate that the genus *Culicelsa* is not well founded or that the association of larvæ and adults under *C. inconspicuus* is inaccurate (see also Proc. ent. soc. Wash., vii, 48, 1905).

GENERIC LOCATION OF CULEX DISCOLOR COQ. — I included this species among the unidentified list under the genus *Grabhamia* (Proc. ent. soc. Wash., vii, 48, 1905), but Smith's figures recently at hand show it to be referable to the genus *Feltidia*. The larva differs from the other larvæ of *Feltidia* known to us, among other things, in that the air tube is not inflated. Its characters are, as it were, curiously reversed, for it is the antennæ, on the opposite end of the larva, that are inflated.

DEINOCERITES CANCER THEOB. IN THE UNITED STATES. — In a recent brief tour of Florida by Mr. Caudell and myself, this Jamaican species was discovered at Miami. Dr. Grabham describes the larva as living in crab holes, and these were accordingly searched. At the time of our visit (March), there had been no rain for weeks and all the holes were dry, so that, except for a fortuitous circumstance, the species would have been missed. It happened that opposite Miami a canal is being

cut through the peninsula, and the salt water from the dredging operations filled three or four holes at the edge of the mangrove swamp on the Biscayne Bay side. In one of these holes several larvæ were found, which had just hatched from the influence of the water. The species must pass the dry season in the egg state.

HABITS OF *CULEX TRICHURUS* DYAR. — As already shown, this species has a northern distribution throughout North America. The larvæ are among the earliest appearing of the early Spring species. They inhabit open grassy pools, swamps and woods pools, not in large numbers, but rather generally distributed. In April, 1905 (a backward season), we found all the largest larvæ in several collections at Chicopee, Mass., and Plattsburgh, N. Y., to be of this species. The larvæ descend easily to the bottom when disturbed where they wriggle in the mud, so that deep dipping is required to collect them. They soon seek the surface however. The larvæ are light in color, rather yellowish, and can be picked out from the other inhabitants of the pools by this character and their size without a lens.

Class I, HEXAPODA.

Order V, LEPIDOPTERA.

SOUND PRODUCED BY LEPIDOPTEROUS LARVÆ.

By HARRY FEDERLEY,

HELSINGFORS, FINLAND.

In No. 2, Vol. XII, of this Journal Professor Packard has published some observations upon sound produced by caterpillars. On Professor Packard's request for information regarding this question the editor has appended some. As I have been occupied during the last few years with the rearing of lepidopterous larvæ and have also made some observations regarding the production of sound by these creatures, I beg to herewith communicate the same.

The larva of the North American Saturnian moth *Telea polyphemus* can, in the third and fourth stages, by rubbing the powerfully constructed mandibles against each other produce a tolerably loud, tapping sound, which is audible at the distance of several meters. That here is question of a means of intimidation is not to be doubted, for

if the larva is left in peace it keeps perfectly quiet, but when the larva-cage is touched, or the larvæ are taken out, they make this peculiar tapping sound, resembling the ticking of a watch. In the fifth stage, singularly enough, the larvæ could not be made to tap, but this might possibly have been due to unfavorable climatic conditions.

The Finnish species of the genus *Drepana*, namely, *curvatula*, *lacertinaria* and *falcataria*, produce, like the *Drepana arcuata*, by rubbing the anal segment against the surface of the leaf, a peculiar scraping (rasping) sound. This sound, which is also tolerably loud, arises from the friction of two small chitinous teeth against the leaf. The chitin formations in question, which are somewhat dissimilar in the different species, are evidently rudiments of the vanished anal legs, which the adjacent hairs clearly indicate, as they occupy the same position round the chitin hooks as round the anal legs in the allied forms.

The *Dicranura* as well as the *Cerura* species make, when disturbed, a loud scraping sound by swinging the foremost part of the body from one side to the other, thereby pressing the mouth-parts against the surface of the leaf. This peculiarity seems to belong to all Notodontous caterpillars, although to none in so great a degree as to the genera named.

Finally I will again repeat what Staudinger* relates of a species from the Amur district, *Smerinthus dissimilis* Brem., which goes to prove that not only larvæ, but also pupæ can produce sound. "The caterpillar, like the pupa of this species, makes, on being disturbed, a tolerably loud sound. Graeser calls the same whistling; that which I have heard from pupæ I might call rattling. The peculiar pupa, which is somewhat flattened on the ventral side and rough all over, has, at the extremity of the three middle segments of the body short, strong indentations and can, like the *Kentrochrysalis streckeri* Staud., move onwards with tolerable celerity."

That all the sound-productions mentioned here are a means of intimidation at the disposal of the larvæ, there can scarcely exist any doubt.

* Mémoires sur les Lépidoptères. N. M. Romanoff, Tome VI, 1892, p. 232, Pl. IV, fig. 3.

A REVIEW OF THE HESPERIIDÆ OF THE UNITED STATES.

BY HARRISON G. DYAR, A.M., PH.D.,

WASHINGTON, D. C.

I have remarked on the latest general work on the Hesperiidæ (Jour. N. Y. ent. soc., xiii, 98, 1905) and pointed out that nearly half of the United States species were omitted therefrom. Our species have, therefore, yet to be correctly placed. An attempt to do this was made in Bulletin 52, U. S. National Museum, but the result is unreliable as there was no time then for special study. Dr. Holland has placed the commoner forms in the "Butterfly Book"; but his arrangement does not agree with Mabille's entirely and he has omitted many species. Scudder's system has been adopted by all the leading students of the Hesperiidæ, Watson, Godman and Salvin, Holland, Mabille; it is time that our species were correctly arranged. I have endeavored to do that in the present article and have referred all the described forms to their modern genera. Five species that I have not seen are inferred from the descriptions only, viz., *Pamphila harpalus* Edwards, *P. cabelus* Edwards, *P. yuma* Edwards, *P. milo* Edwards and *P. chusca* Edwards. For a few others not seen I have other evidence. I am indebted to Dr. Hy. Skinner for loan of some types and for permission to look over his collection; I have also looked at some specimens in the collection of the Brooklyn Institute by the kindness of Mr. Doll and in the Strecker collection by the kindness of Mrs. E. E. Strecker. My main reliance, naturally, has been the collection of the United States National Museum, including Mr. Wm. Schaus' material on deposit there.

Family HESPERIIDÆ.

Subfamily PYRRHOPYGINÆ.*

Genus PYRRHOPYGA Hübner.

P. arizonæ Godman & Salvin.

Our species has been erroneously identified as *P. araxes* Hew.; but

*The definitions of the subfamilies and sections are given in Mabille's work.

it differs therefrom in the smaller size, browner tint and greater diffusion of the ochreous color below.

Subfamily HESPERIIDÆ.

SECTION A.

KEY TO THE GENERA.

1. Fore wings with a costal fold..... 10.
Fore wings without a costal fold..... 2.
2. Apex of fore wings truncate..... **Proteides**.
Apex of fore wings not truncate..... 3.
3. Male with a tuft of hairs on hind wing above..... **Cogia**.
Hind wing without such a tuft..... 4.
4. Palpi ascending, second joint applied to face..... 5.
Palpi porrect..... 7.
5. Fore wings with vein 2 midway between vein 3 and base..... **Heteropia**.
Fore wing with vein 2 arising well toward base..... 6.
6. Club of antennæ ovoid with fine point as long as the club..... **Acolastus**.
Club gradually thickened, curved at the middle..... **Telegonus**.
7. Vein 5 of fore wings not central, near to vein 6..... **Cabares**.
Vein 5 of fore wings central..... 8.
8. Vein 3 of fore wings over 4 times as far from base as from cross vein.
Rhabdoides.
Vein 3 of fore wings less than 4 times as far from base..... 9.
9. Third joint of palpi long, porrect; reflexed part of club not equal to the basal part..... **Phædinus**.
Third joint of palpi short; reflexed part of club equal to the basal part.
Thorybes.
10. Hind wings with a long anal prolongation..... **Eudamus**.
Hind wings without this prolongation..... 11.
11. Lower discocellular long and strongly arcuate..... **Phocides**.
Lower discocellular short..... 12.
12. Hind wings with a distinct anal lobe..... 13.
Hind wings rounded..... 14.
13. Fore wings elongate, pointed..... **Epargyreus**.
Fore wings trigonate..... **Plestia**.
14. Club insensibly enlarged with a fine point..... 15.
Club with the first part ovoid ending in a fine point..... **Nascus**.
15. Fore wings with the apex sharply and squarely pointed..... **Murgaria**.
Fore wings with the apex more rounded..... 16.
16. Outer margin of hind wings nearly straight..... **Achlarus**.
Outer margin of the hind wings convex, rounded..... **Cocceius**.

Genus PHOCIDES Hübner.

SYNOPSIS OF SPECIES.

1. Hind wings entire; fore wings with a red spot..... **lillea**.
Hind wings crenulated; fore wings without a red spot..... 2.

2. Fore wings with hyaline white spots.... *urania*.
Fore wings without spots..... *batabano*.

P. lilea Reakirt.

The species is reported as occurring with us. I have seen a specimen from Texas in Dr. Skinner's collection. It is apparently a visitant only.

P. urania Westwood.

Reported from our southern border.

P. batabano Lefebvre.

It occurs in southern Florida, the larva feeding on the mangrove.

Genus ACOLASTUS Scudder.

A. amyntas Fabricius.

It occurs in southern Florida, the larva on *Piscidia*.

Genus EUDAMUS Swainson.

SYNOPSIS OF SPECIES.

- | | |
|---|------------------------|
| 1. Fore wings with distinct quadrate whitish hyaline spots..... | 2. |
| Fore wings with very faint or no spots..... | <i>simplicius</i> . |
| 2. Hind wings without any white shades below..... | 3. |
| Hind wings with distinct white shades below..... | 4. |
| 3. Wings with metallic green shades basally..... | <i>proteus</i> . |
| Wings without any metallic green shading..... | <i>dorantes</i> . |
| 4. White shade on hind wings below, submarginal, entire..... | <i>alcæus</i> . |
| This shade median, cut by two brown spots..... | <i>zilpa</i> . |
| This shade a straight central fascia..... | <i>albofasciatus</i> . |

E. proteus Linnæus.

Inhabits the southern States, the larvæ on plants of the bean family.

E. dorantes Stoll.

Occurs in Texas, but is not widespread in our region.

E. simplicius Stoll.

Reported from our southern border.

E. alcæus Hewitson.

Reported from our southern border.

E. zilpa Butler.

Reported from our southern border.

E. albofasciatus Hewitson.

Occurs in Texas.

Genus PLESTIA Mabilie.

P. dorus Edwards.

Occurs in Arizona.

Genus PROTEIDES Hübner

P. idas Cramer.

Reported from our southern border.

Genus **EPARGYREUS** Hübner.

SYNOPSIS OF SPECIES.

1. Hind wing without silver spots below.....**zestos**.
Hind wing with silvery spots below..... 2.
2. Silvery spot divided; fore wing with fulvous shading at base.....**exadeus**.
Silvery spot entire; fore wing without fulvous shading at base.....**tityrus**.

E. tityrus Fabricius.

Common throughout most of the United States, the larva on locust and other plants of the pea family.

E. exadeus Cramer.

Reported from our southern border.

E. zestos Hübner.

Occurs in southern Florida.

Genus **NASCUS** Watson.**N. hesus** Westwood & Hewitson.

Reported from our southern border.

Genus **HETEROPIA** Mabilie.**H. melon** Godman & Salvin.

Reported from our southern border.

Genus **ACHLARUS** Scudder.**A. lycidas** Abbot & Smith.

Occurs in the Atlantic region, the larva on certain wild plants of the pea family.

Genus **RHABDOIDES** Scudder.**R. cellus** Boisduval & Leconte.

Occurs in Arizona.

Genus **MURGARIA** Watson.**M. albociliata** Mabilie.

The species occurs in Arizona. I have it from the Patagonia Mountains, taken by Mr. Osler. *Eudamus coyote* Skinner from Texas is a synonym. The costal fold is present in the type, though it is much narrower than in the Arizona specimens.

Genus **COGIA** Butler.

SYNOPSIS OF SPECIES.

1. Large, the fringe of hind wings white.....**hippalus**.
Small, the fringe not white.....**outis**.

C. hippalus Edwards.

Occurs in Arizona.

C. outis Skinner.

Occurs in Texas.

Genus PHÆDINUS Godman & Salvin.

SYNOPSIS OF SPECIES.

1. Hind wings with the fringe not white.....*mysie*.
Hind wings with the fringe white..... 2.
2. Smaller, the hind wings rounded.....*caicus*.
Larger, the hind wings elongate.....*epigena*.

P. mysie Dyar.

Occurs in Arizona.

P. caicus Herrich-Schaeffer.

Occurs in Arizona.

P. epigena Butler.

Occurs in Arizona. Dr. Skinner makes this a synonym of *epigona* H.-S., but Mabille puts *epigona* in *Rhabdoides*, whereas *epigena* falls in *Phædinus*. I use the name that I feel the more sure of.

Genus COCCEIUS Godman & Salvin.

SYNOPSIS OF SPECIES.

1. Hind wings with the fringe white.....*drusius*.
Hind wings with the fringe not white.....*pylades*.

C. drusius Edwards.

Occurs in southern Arizona.

C. pylades Scudder.

Occurs throughout the Northern Atlantic states, Canada and the Pacific coast. I have specimens from Ft. Smith, Mackenzie, taken by Mr. Merritt Cary. Dr. Lintner described *Eudamus electra* from Canada, which I suppose must be a synonym of this species. I have not seen the type; it cannot be found in Albany, as Dr. Felt informs me.

Genus THORYBES Scudder.

SYNOPSIS OF SPECIES.

1. Under side of hind wings smooth, brown, with violet reflections.....*daunus*.
Under side rough, squamose with irrorations..... 2.
2. Larger; spottings of fore wings smaller.....*mexicana*.
Smaller; spottings of fore wings larger.....*æmilia*

T. daunus Cramer.

It is generally known as *bathyllus* S. & A., and inhabits the Southern States and Mississippi Valley.

T. mexicana Herrich-Schaeffer.

Occurs in Colorado and Nevada.

T. æmilia Skinner.Occurs in the mountains of California and Oregon. I think it is not specifically distinct from *mexicana* H.-S., but only a local race of that species.Genus **TELEGONUS** Hübner.**T. hahneli** Staudinger.

Reported from our southern border.

Genus **CABARES** Godman & Salvin.**C. potrillo** Lucas.

Reported from our southern border.

SECTION B.

KEY TO THE GENERA.

1. Club of the antennæ thickened at the end, which is obtuse and bare..... 2.
Club of antennæ tapered at the end..... 5.
2. No costal fold in the male..... **Hesperopsis**.
A costal fold present in the male..... 3.
3. A pair of long lobes covering a bare hollow at base of abdomen in male.
Scelothrix.
These lobes short or absent..... 4.
4. Hind tibiæ with a hair pencil **Heliopetes**.
Hind tibiæ without a hair pencil..... **Pyrgus**.
5. Point of club of antennæ obtuse..... 6.
Point of club sharp..... 11.
6. Fore wings with no costal fold..... **Chiomara**.
Fore wings with a costal fold in the male..... 7.
7. Fore wings with a sinus at anal angle; two excavations on hind wing... **Systasea**.
Fore wings with a small sinus; hind wings crenulate..... 8.
Fore wings entire 9.
8. Hind legs of male with a hair pencil **Celotes**.
Hind legs with no hair pencil..... **Staphylus**.
9. Costal fold of the male long, over half the margin..... 10.
Costal fold short, less than half the margin..... **Pholisora**.
10. Third joint of palpi moderate, less than twice as long as wide..... **Thanaos**.
Third joint long, over twice as long as wide..... **Bolla**.
11. Apex of fore wing falcate **Eantis**.
Fore wings not falcate..... 12.
12. No costal fold in the male..... **Grais**.
A costal fold present in the male..... 13.
13. Wings elongate; hind wings wavy..... **Timochares**.
Wings trigonate; hind wings entire..... **Melanthes**.

Genus **SCELOTHRIX** Rambur.

SYNOPSIS OF SPECIES.

- | | |
|---|---------------------|
| 1. Size larger, expanse 22-28 mm..... | 2. |
| Size smaller, expanse 19-24 mm..... | 3. |
| 2. Hind wings with faint white spots above..... | <i>centaureæ</i> . |
| Hind wings with distinct white spots above..... | <i>cæspitalis</i> . |
| 3. Fringe of wings black spotted .. | <i>xanthus</i> . |
| Fringe white | <i>scriptura</i> . |

S. centaureæ Rambur.

Inhabits the Atlantic States, though it is rare; extends into the Northwest; I have a specimen from Ft. Providence, Mackenzie (Preeble).

S. cæspitalis Boisduval.

Inhabits the Pacific coast from British Columbia to California.

S. xanthus Edwards.

Described from southern Colorado and perhaps only a small form of *centaureæ* as Mabille suggests.

S. scriptura Boisduval.

From Arizona, New Mexico and California.

Genus **HELIOPETES** Billberg.

SYNOPSIS OF SPECIES.

- | | |
|---|---------------------|
| 1. Fore wings white with black apical shading | 2. |
| Fore wings with outer black checkered border..... | 3. |
| 2. Under side of hind wings with two brown patches at right angles..... | <i>laviana</i> . |
| With these patches subparallel | <i>macaira</i> . |
| 3. Fore wings spotted with white on the median area..... | 5. |
| Fore wings with the median area more or less broadly white..... | 4. |
| 4. Black submarginal band of hind wings obsolete or dentate..... | <i>ericetorum</i> . |
| Black submarginal band broad, nearly straight | <i>domicella</i> . |
| 5. Hind wings with distinct markings below..... | <i>syrictus</i> . |
| Hind wings with the marks nearly obsolete, white..... | <i>philetas</i> . |

H. laviana Hewitson.

Reported from our southern border.

H. macaira Reakirt.

Reported from our southern border.

H. ericetorum Boisduval.

Occurs in California, both in the plains and mountains.

H. domicella Erichson.

Reported from our southern border.

H. syrictus Fabricius.

Reported from our southern border. Mabille includes this species

in the genus *Hesperia*, section *Pyrgus*, although it directly contradicts his diagnosis. We have no species of *Hesperia* in America; all our species have the costal fold in the male. *Syrichtus* falls in *Heliopterus* on the presence of the hair pencil on the hind tibiae.

H. philetas Edwards.

Described from one female from western Texas. From this type the generic position cannot be ascertained; but Dr. Barnes has given me a male from Huachuca Mts., Arizona, which he has identified as *philetas*. It resembles *syrichtus* above and has the hair pencil; below the hind wings are nearly entirely white.

Genus PYRGUS Hübner.

P. montivaga Reakirt.

Occurs throughout the United States. We have been listing two species, *montivaga* Reak. and *tessellata* Scudd., but Mabilie unites them, following Godman and Salvin.

Genus HESPEROPSIS, new.

Much as in *Hesperia* Fab., but the palpi long, with long, distinct, porrect, terminal joint. No costal fold in the male; no hair pencil on hind tibiae; two pairs of spurs. Club of antennae ovoid, gently curved, the tip blunt and bare. Wings broad with entire margins.

Type. — *Pholisora alphæus* Edwards.

SYNOPSIS OF SPECIES.

- | | |
|--|------------------|
| 1. Fore wings blackish with white spots..... | 2. |
| Fore wings gray irrorate, black dashes in subterminal space..... | <i>alphæus</i> . |
| 2. Under side of hind wings with many white spots..... | <i>libya</i> . |
| Under side of hind wings with a single discal bar..... | <i>lena</i> . |

H. libya Scudder.

Occurs in southern California and Arizona.

H. lena Edwards.

The types were from Montana. This may be a variety of *libya* as I learn from consulting with Dr. Skinner. I have not seen any certainly determined specimens.

H. alphæus Edwards.

Occurs in Arizona. Mabilie places these species in *Pholisora* without comment, although they contradict his diagnosis in the absence of the costal fold and the shape of the club of the antennae. Godman and Salvin also leave *alphæus* in *Pholisora*; but they express

doubt and mention the different shape of the club. I have thought it advisable to erect a new genus.

Genus **CHIAMARA** Godman & Salvin.

SYNOPSIS OF SPECIES.

1. Hind wings with white spots on the disk.....asychis.
Wings without any white except on the fringe.....gesta.

C. asychis Cramer.

Reported from our southern border. The species looks like a *Helioptetes*.

C. gesta Herrich-Schaeffer.

Occurs in Texas. *Nisoniades llano* Dodge is a synonym of it as I learn from examining the type which Mr. Dodge has kindly sent to me.

Genus **EANTIS** Boisduval.

E. thraso Hübner.

Occurs in Texas on our southern border.

Genus **GRAIS** Godman & Salvin.

G. stigmaticus Mabilie.

Reported from our southern border.

Genus **TIMOCHARES** Godman & Salvin.

T. ruptifasciatus Plotz.

Reported from our southern border.

Genus **SYSTASEA** Butler.

S. pulverulenta Felder.

Occurs in Texas. Dr. Skinner makes *zampa* Edw. a synonym and I follow him, although Mabilie keeps these names separate.

Genus **BOLLA** Mabilie.

SYNOPSIS OF SPECIES.

1. Head and palpi above golden yellow.....ceos.
Head and palpi above fuscous.....brennus.

B. ceos Edwards.

Occurs in southern Arizona.

B. brennus Godman & Salvin.

Reported from our southern border.

Genus **CELOTES** Godman & Salvin.

C. nesus Edwards.

Occurs in Texas and Arizona.

Genus *PHOLISORA* Scudder.*P. catullus* Fabricius.*P. mejicanus* Reakirt.

I am unable to distinguish these forms except by the locality. Specimens from Arizona, New Mexico, southern California and Mexico I have referred to the latter; those from the rest of the United States to the former. Godman and Salvin give genitalic differences, which I have not looked for.

Genus *MELANTHUS* Mabille.*M. brunnea* Herrich-Schaeffer.

Occurs on the Florida Keys. Mabille places *Melanthus* in the section of the table that has the point of the antennal club obtuse, but it appears to me to be sharp and I have placed it accordingly. Dr. Skinner is responsible for the determination.

Genus *THANAOS* Boisduval.

SYNOPSIS OF SPECIES.

1. Fore wings with rows of black-edged spots without hyaline centers..... 2.
Fore wings with some of the spots white-hyaline centered..... 5.
2. Male darkly blackish, the spots not contrasting.....*somnus*.
Male less dark, the spots more relieved..... 3.
3. Larger species.....*brizo*.
Smaller species..... 4.
4. Bands normal, the outer one well beyond the cell.....*icelus*.
Bands abnormal, the outer one composed of clavate rays.....*ausonius*.
5. Fringe of fore wings dark..... 6.
Fringe of fore wings white..... 15.
6. Smaller species, the white dots mostly punctiform..... 7.
Larger species, some of the white dots of large size..... 13.
7. Markings strongly contrasted.....*martialis*.
Markings not well contrasted..... 8.
8. A discolorous brownish patch over end of cell.....*nævius*, *terentius*.
This patch not distinct, or absent..... 9.
9. Male very dark with marks nearly obscured..... 10.
Male less dark with the markings more contrasted..... 11.
10. Wings brownish tinted, markings legible, though obscure.....*persius*.
Wings densely black, the markings nearly completely lost.....*perisigra*.
11. Fore wings hoary gray powdered.....*afraninus*.
Fore wings not gray powdered..... 12.
12. Smaller species.....*lucilius*.
Larger species.....*lilius*.
13. Fore wings hoary gray powdered.....*propertius*.
Fore wings not gray powdered..... 14.

14. Two whitish subapical spots on hind wings below.....juvenalis.
Without these spots.....petronius, horatius.
15. Fore wings elongate, with brown discolorous patch at end of cell.....funeralis.
Fore wings less elongate, without a patch at end of cell..... 16.
16. Smaller species with distinct markings.....pacuvius.
Larger species with indistinct markings..... 17.
17. Hind wings below with white spots within the fringe.....clitus.
Hind wings below without these spots.....tristis, tatus.

T. somnus Lintner.

Occurs in Florida. It is, perhaps, but a dark form of *brizo*; the male genitalia are the same.

T. brizo Boisduval & Leconte.

Occurs in the northern Atlantic and Pacific states, Washington to Athabasca. *T. callidus* Grinnell, from southern California, I was unable to formulate from the description; but Mr. Grinnell has most kindly sent me the male type, which I find to be a rather small narrowly marked *brizo* with dark ground color.

T. icelus Lintner.

Occurs in the Atlantic States.

T. ausonius Lintner.

Described from Albany, New York and never since found. It is presumably an aberration.

T. martialis Scudder.

Occurs in the Atlantic states.

T. terentius Scudder & Burgess

Occurs in the southern Atlantic states. I cannot differentiate Lintner's *navius* of Florida from this.

T. persius Scudder.

Occurs in the Atlantic states.

T. pernigra Grinnell.

Mr. Grinnell has obligingly loaned me the unique type. The species represents the eastern *persius* in California, but is separable therefrom by the very dark coloration.

T. lucilius Lintner.

Occurs in the Atlantic states.

T. afranius Lintner.

Occurs in the Rocky Mountains, Montana to Nevada.

T. lilius Dyar.

Occurs in the Pacific states, Washington, British Columbia, Cali-

fornia. I imagine this will prove synonymous with *tibullus* Scudd. & Burg., which I do not otherwise know. The genitalia of *lilius* are much like the figure of those of *tibullus*. In the *lilius* examined the middle lobe of the left side piece is smooth without spines; otherwise I see no essential difference.

T. proprius Lintner.

Occurs in the Pacific states. Specimens from Colorado formerly identified as *proprius* I now consider to be large examples of *afra-nius*. Their genitalia differ from the *proprius* of California, which proves there are two species although they are so similar.

T. juvenalis Fabricius.

Occurs in the Eastern states.

T. horatius Scudder & Burgess.

Occurs in the southern Atlantic states. I am unable to differentiate Lintner's *petronius* from Florida from this species except by the more contrasted coloration and larger spots. I do not think that they are the same, but rather that *petronius* will prove to be *juvenalis* without the white spots on the hind wings below. This character is not improbably evanescent, and is the only one I know of to separate *petronius* and *juvenalis*. *T. plautus* Scudd. & Burg., hitherto unidentified, is not improbably another synonym of *juvenalis*. The figure of the genitalia does not appear specifically different, supposing the pieces to be in a different position. The right clasp may be broken and its basal lobe somewhat uncurved. Considerable allowance has to be made in the appearance of the figures of these organs, but there is really no great variation, though their complex appearance makes them difficult to interpret at first.

T. funeralis Scudder & Burgess.

Occurs in the western states, Texas, Arizona, California.

T. pacuvius Lintner.

From Colorado and Arizona.

T. clitus Edwards.

From Arizona and Mexico. This seems the same as *albomarginatus* of Godman & Salvin.

T. tristis Boisduval.

Occurs in the western states, Southern California, Arizona, Mexico. I cannot differentiate Edwards' *tatius* from this.

The following table separates the species of *Thanaos* by the male genitalia for those species that have been examined:

1. Right side piece with an outward projection at right angles; both tips spinose.. 2.
Right side piece without any outward projection, the lobe basal or subbasal and more or less parallel to the body of the clasp 3.
2. Middle projection of left side piece longer than wide and basally curved, approximated to the clasp **brizo, somnus.**
This projection wider than long, short, truncate..... **icelus.**
3. Left side piece with no central projection; projection of right side piece unusually basal, remote, conic..... **martialis.**
Left side piece with a central projection; projection of right piece less basal approximate..... 4.
4. Basal lobe of left side piece slender, longer than wide..... **persius, lucilius.**
This lobe broad, square, the inner angle sometimes produced..... 5.
5. Projection of right side piece very broad and truncate..... 7.
This part moderate, band-shaped, curved toward base..... 6.
6. Middle lobe of left side piece with spiny inner angle and short outward point. **juvenalis.**
This lobe with a long distinct concave outer point..... **afranius.**
7. Tip of right piece long produced, finger-shaped..... 8.
Tip of right piece shortly produced, truncate 9.
8. Basal lobe of right side piece concave on the side..... **propertius.**
This lobe convex on the side and roundedly curved down..... **tibullus, lilii.**
9. Basal lobe of right side piece well hollowed at the margin; middle point of left side piece smooth..... **horatius.**
Basal lobe of right side piece scarcely hollowed; middle lobe of left side piece spinose 10.
10. Basal lobe of right side piece slightly concave within; tips square and joined to the side piece **terentius, nævius.**
This lobe convex within with a narrow tip..... **funeralis.**
This lobe with a double pointed tip next to the the terminal lobe..... **tristis.**

Subfamily PAMPHILINÆ.

SECTION A.

KEY TO THE GENERA.

1. Posterior tibiæ with one pair of spurs..... **Pamphila.**
Posterior tibiæ with two pairs of spurs..... **Dalla.**

Genus PAMPHILA Fabricius.

P. palæmon Pallas.

This European species occurs throughout the North from Maine to British Columbia and the mountains of California.

Genus DALLA Mabilie.

I have gathered three species from the genera *Butleria*, *Pholisora* and *Pyrgus* where they were formerly associated. Mabilie has restricted *Butleria* to Chilean species and erects a new genus, *Dalla*,

in which he puts some of Godman and Salvin's species of *Butleria*, so that I presume he intends his genus to replace *Butleria* as used by them.

SYNOPSIS OF SPECIES.

1. Hind wings with spots below..... 2.
Hind wings immaculate..... *pirus*.
 2. Many small spots on hind wings below *microsticta*.
A few large spots on hind wings below..... *polingii*.
- D. *pirus* Edwards.**
Occurs in Colorado, Utah and New Mexico.
- D. *microsticta* Godman & Salvin.**
Reported from our southern border.
- D. *polingii* Barnes.**
Occurs in southern Arizona.

SECTION B.

KEY TO THE GENERA.

1. Antennæ with the point of the club absent; end obtuse..... 2.
Antennæ with the point of the club present; end sharp 6.
2. Fore wings of male with a linear stigma..... 3.
Wings without a stigma 5.
3. Stigma nearly longitudinal..... *Copæodes*.
Stigma oblique, normal 4.
4. Fore wing with vein 2 nearer base than end of cell..... *Adopæa*.
Fore wing with vein 2 at middle of cell..... *Chærephon*.
5. Fore wing with vein 12 short, the wing enlarged costally..... *Ancyloxypha*.
Fore wing with vein 12 longer; wing normally shaped..... *Oarisma*.
6. Antennæ with the point of the club short, less than width of club..... 7.
Point of club long, equal to or greater than the width of the club 12.
7. Antennæ short, equal to the width of the thorax..... *Hylephila*.
Antennæ longer, twice the width of the thorax..... 8.
8. Vein 3 of fore wings well before the end of the cell..... *Polites*.
Vein 3 of fore wings near the end of the cell..... 9.
9. Male stigma with modified scales below 10.
Male stigma without modified scales below..... *Ochlodes*.
10. Stigma apparently continuous 11.
Stigma divided by raised silky scales *Catia*.
11. A large black patch below stigma..... *Atalopedes*.
A small black area below stigma..... *Thymelicus*.
An obscure, weak fulvous area below stigma *Erynnis*.
12. Mid tibiæ with long distinct spines..... 13.
Mid tibiæ not, or very feebly spined..... 24.
13. Fore wings of male with a stigma..... 14.
Fore wings without a stigma..... 20.

14. Vein 2 at or beyond the middle of the cell..... 15.
 Vein 2 arising well before the middle of the cell..... 17.
15. Male stigma thick, curved somewhat S-shaped..... *Lerema*.
 Male stigma linear, oblique 16.
 Male stigma a broad illy defined patch. *Epiphyes*.
16. Third joint of palpi longer, more slender.. *Maistor*.
 Third joint of palpi moderate, thicker..... *Atrytonopsis*.
17. Outer margin incised above anal angle; hind wings lobed..... *Thespheus*.
 Wings entire 18
18. Male stigma double, parallel, on the veins *Stomyles*.
 Male stigma oblique, normal 19.
19. Third joint of palpi long and slender..... *Amblyscirtes*.
 Third joint of palpi short and obtuse..... *Paratrytone*.
20. Wings broad and ample..... 21.
 Fore wings trigonate, hind wings rounded, normal..... 22.
21. Hind wings with vein 3 from the end of the cell..... *Phycanassa*.
 Hind wings with vein 3 before the end of the cell..... *Poanes*.
22. Fore wings elongate; hind wings subcaudate..... *Calpodēs*.
 Wings not so much produced 23.
23. Vein 3 of fore wings well before end of cell..... *Atrytone*.
 Vein 3 of fore wings near end of cell..... *Lerodea*.
24. Male with a stigma..... 25.
 Without a stigma..... 26.
25. Fore wings with vein 3 near end of cell; wings black..... *Euphyes*.
 Vein 3 more remote from end of cell; wings fulvous spotted..... *Limochroes*.
26. Antennæ moderate, half as long as costa..... 27.
 Antennæ long, reaching over half the costa..... *Padraona*.
27. Fore wings elongate; hind wings subcaudate..... *Prenes*.
 Fore wings normally shaped..... *Anatrytone*.

Genus *ADOPÆA* Billberg.

SYNOPSIS OF SPECIES.

1. Hind wings below with black shades, separated by a whitish ray..... *eunus*.
 Hind wings below nearly immaculate pale ochre yellow..... *wrightii*.

A. eunus Edwards.

Occurs on the Pacific coast. It was described from Mt. Hood; I have specimens from Los Angeles, California, and the Argus Mts. The latter have nearly lost the markings below.

A. wrightii Edwards.

I have examined four specimens in the Strecker collection from the Mojave Desert. It is not more than a local form of the preceding species.

Genus *CHÆREPHON* Godman & Salvin.

SYNOPSIS OF SPECIES.

1. Outer band on fore wings below well excurved at cell..... *rhesus*
 This band nearly evenly arcuate..... *carus*.

C. rhesus Edwards.

Occurs in the mountains of Colorado and Mexico at high altitudes.

C. carus Edwards.

Occurs in the Huachuca and Catalina mountains of Arizona.

Genus COPÆODES Speyer.**C. auriantia** Hewitson.

Not uncommon in Texas, New Mexico and Arizona. We have been calling it by the name *procris* Edw.; but that has been shown to be a synonym.

Genus ANCYLOXYPHA Felder.

SYNOPSIS OF SPECIES.

- | | |
|--|-------------------|
| 1. Fore wings suffused with blackish..... | 2. |
| Fore wings fulvous with blackish outer border..... | <i>arene</i> . |
| 2. Fore wings with bronzy reflections..... | <i>numitor</i> . |
| Fore wings with bluish reflections..... | <i>longleyi</i> . |

A. arene Edwards.

Occurs in southern Arizona. *C. myrtis* Edw. (Bulletin 52, U. S. Nat. Mus., no. 477) is a synonym.

A. numitor Fabricius.

Common throughout the eastern United States, flying in grass near water.

A. longleyi French.

Described from one female taken near Chicago. I doubt its distinctness from *numitor*. Mr. Longley writes me that it was taken on the prairie away from water, but he suggests that it may have emerged from some barn where it could have been carried as pupa. If so, the unusual dryness may be the cause of the aberrant coloration of the imago. No second specimen has been met with.

Genus OARISMA Scudder.

SYNOPSIS OF SPECIES.

- | | |
|--|---------------------|
| 1. Fore wings bright bronzy with dark contrasted fringes | <i>edwardsii</i> . |
| Fore wings overspread with bronzy; smaller species..... | <i>garita</i> . |
| Fore wings broadly bronzy on the costa; larger species..... | <i>powescheik</i> . |

O. edwardsii Barnes.

Occurs in Arizona and Colorado. It is hardly more than a race of *garita*, and may be the *hylax* of Edwards, as Dr. Barnes points out to me.

O. garita Reakirt.

Occurs in Colorado, Dakota and Manitoba.

O. powescheik Parker.

I have it from Wisconsin and Michigan.

Genus **HYLEPHILA** Billberg.

H. phylæus Drury.

Common in the Southern States to southern California and Mexico.

Genus **POLITES** Scudder.

P. coras Cramer.

Common in the eastern United States. Both sexes vary markedly in the amount of reduction of the fulvous markings, so that extremes might be easily thought different species. It is more familiar to us under the synonymical name *peckius* Kirby.

Genus ATALOPEDES Scudder.

SYNOPSIS OF SPECIES.

- i. Female with a fulvous submarginal band and ray in cell of hind wings above. campestris.
 Female with one bifid yellow spot on hind wings above.....mesogramma.

A. campestris Boisduval.

Occurs throughout the United States in the more southern portions; in the Mississippi Valley as far north as Dakota.

A. mesogramma Latreille (*cunaxa* Hewitson).

Included on the authority of Mabilie, who credits the species to "North America." This may refer to the West Indies or Mexico. I do not know the species.

Genus THYMELICUS Hübner.

SYNOPSIS OF SPECIES.

- | | |
|--|--------------|
| 1. Male stigma narrow, linear, straight and small..... | baracoa. |
| Male stigma broader, thicker, somewhat sinuous, large | 2. |
| 2. Stigma nearly continuous | 3. |
| Stigma partly divided, showing an upper and lower black spot and an outward oblique black bar..... | 6. |
| 3. Hind wings below grayish straw color with faint outer row of pale spots... | alcina. |
| Hind wings below brownish with an outer row of yellow spots and one in cell. | 4. |
| 4. Spots on hind wings below larger, diffused, nearer margin | mystic. |
| Spots below smaller, concrete, further from the margin..... | 5. |
| 5. Fore wings scarcely washed with fulvous beyond the stigma..... | siris. |
| Fore wings distinctly washed with fulvous beyond the stigma..... | sylvanoides. |
| 6. Hind wings predominantly light colored below with dark markings..... | 7. |
| Hind wings dark colored below, immaculate or with light markings..... | 8. |
| 7. Marginal band of fore wings of male broad, heavy..... | vibex. |
| Marginal band narrow, dentate..... | brettus. |
| Marginal band still narrower, broken opposite cell..... | chusca. |

Marginal band still narrower, broken opposite cell.....chusca.

8. Hind wings immaculate below.....*cernes*.
 Hind wings with light markings below..... 9.
 9. Veins of hind wings below dark, separating the spots..... 10.
 Veins pale, uniting and producing the spots.....*sabuleti*.
 10. Marks on hind wings below distinct.....*draco*.
 Marks on hind wings below faint and clouded.....*mardon*.

T. baracoa Lucas.

It is found in Florida.

T. alcina Skinner.

From Colorado. Dr. Skinner thinks that this may be *rhena* Edw., but we have not seen the type.

T. mystic Scudder.

Occurs in the eastern United States.

T. sylvanoides Boisduval.

Occurs on the Pacific coast and mountains.

T. siris Edwards.

Occurs in the western United States, Rocky Mountains to the Pacific coast. I doubt the distinctness of this form from *sylvanoides*. Both sexes are a little darker, but I see no other difference.

T. vibex Hübner (*stigma* Skinner, not Staudinger).

Occurs on our southern border.

T. brettus Boisduval & Leconte.

Inhabits the Southern States. I think this is only a varietal form of *vibex*. The dark markings in the male are more extended in *vibex*, but they vary. I have specimens from Jalapa, Mexico, labelled *vibex* by Mr. Schaus, which are indistinguishable from Texan *brettus*. Godman and Salvin also are of my opinion (Biol. Cent. Am., Rhop., ii, 480, 1900).

T. chusca Edwards.

Described from one male from Arizona. I have not seen the species.

T. cernes Boisduval & Leconte.

Inhabits the eastern United States.

T. draco Edwards.

From the mountains in the West; southern Colorado, Idaho, Wyoming, Crater Lake, Oregon.

T. mardon Edwards.

Washington (Neumoegen collection, Brooklyn Museum).

T. sabuleti Boisduval.

From the western United States, California, Nevada, Arizona.

Genus *CATIA* Godman & Salvin.*C. druryi* Latreille.

Better known as *otho* A. & S. ; inhabits the eastern United States. It is easily recognized by the peculiar stigma of the male which is a further modification of the *Tymelicus* pattern.

Genus *ERYNNIS* Schrank.

SYNOPSIS OF SPECIES.

1. Hind wings below with spots united into a band forming pale rays on veins.. 2.
These spots divided by dark veins or absent..... 4.
2. Band below white..... 3.
Band below fulvous.....*manitoboides*.
3. Ground color of hind wings below uniformly dark brown.....*metea*.
Ground color varied with greenish and yellow.....*unkas*.
Ground color entirely greenish yellow.....*lasus*.
4. Hind wings with white spots below 5.
Hind wings with the spots not white, yellow, pale or obsolete..... 7.
5. A linear white ray in the cell.....*morrisoni*.
At most a white spot in the cell 6.
6. Male stigma thick, straight, partly doubled.....*comma*.
Male stigma long, linear, curved.....*juba*.
7. Hind wings with pale spots below 8.
Hind wings immaculate 9.
8. Fore wings with the fulvous color reduced, absent from the costal edge..*attalus*.
Fore wings with the fulvous color extended, covering costal edge.....*leonardus*.
Fore wings broadly fulvous, the outer margin broadly pale fuscous.
uricola, cabelys.
9. Stigma as usual, thick, subdivided on vein 2..... 10.
Stigma narrowly linear, continued over vein 2..... 11.
10. Fore wings fulvous with outer fuscous edge.....*pawnee, oregona*.
Fore wings largely fuscous, the fulvous reduced to spots.....*meskei*.
11. Fore wings with a broad dark fuscous edge.....*licinus*.
Fore wings fulvous with a faint marginal cloud.....*ottoe*.
Fore wings ochre yellow, immaculate.....*yuma*.

E. morrisonii Edwards.

I have a male from Colorado (Neumoegen, Meske collection).

E. comma Linnæus.

The species occurs throughout the northern and mountainous parts of the United States and has received many names. In Bulletin 52, U. S. Nat. Mus., eleven varieties are recognized, but I think three or four names will suffice. *Laurentina* Lyman, *colorado* Scudder = *manitoba* Scudder = *nevada* Scudder, *columbia* Scudder, *idaho* Edwards = *assiniboia* Lyman will be referred to the synonymy of *comma*. The varieties are distinguished about as follows :

- Hind wings below dark brown, spots moderate.....*laurentina*.
 Hind wings below gray green, spots often reduced.....*colorado*.
 Hind wings below grayish green, the spots often small and tending to form a
 straight row; smaller than the other forms.....*columbia*.
 Hind wings below light yellow or greenish.....*idaho*.

E. juba Scudder.

From Colorado, Idaho and the mountains of California. Similar to *comma* but larger, brighter fulvous with somewhat more pointed wings, the male stigma narrower and curved. The variety *viridis* Edwards has the wings more obscured with fuscous.

E. metea Scudder.

From the northern Atlantic States and Allegheny mountains.

E. unkas Edwards.

From the Rocky Mountain region, Kansas and Colorado.

E. lasus Edwards.

From southwest Arizona. The male type is in the Neumoegen collection in the Brooklyn Museum.

E. manitoboides Fletcher.

I have Dr. Fletcher's type from Nepigon. I cannot agree with Dr. Skinner that this is a form of *comma*. In the male type the pale lines on the veins below are in evidence as in *metea* and *unkas*; they are lost in the female type, which would fall in the neighborhood of *attalus* and *leonardus*, from which the coloration of the upper side separates it.

E. attalus Edwards.

From the Southern States; common in Florida.

E. leonardus Harris.

From the northern Atlantic States. This is, perhaps, only a form of the preceding.

E. pawnee Dodge.

From the western plains, Utah, Nebraska.

E. oregona Edwards.

From California and Nevada. I have not seen it. From the description it falls near *pawnee*, if it really belongs to the genus *Erynnis*. Edwards says: "Size of *colorado*; bright yellow fulvous on upper side, the subapical spots not well defined. Below grayish yellow, spots scarcely lighter (not white nor even light), the band on the hind wings slight, often maculate."

E. meskei Edwards.

From Indian River, Florida (Neumoegen collection, Brooklyn Museum).

E. licinus Edwards.

I have a single specimen from Texas which Dr. Skinner has determined.

E. cabelus Edwards.

Unknown to me. Described as near *ottoe*, but with pale spots on the hind wings below, lacking, however, in one specimen. Nevada.

E. ruricola Boisduval.

Described from California. I do not know this species. Boisduval's description as supplemented by Edwards makes the species fall near *cabelus*. Mr. Schaus, however, identifies as *ruricola* a specimen of *comma* in which the white spots are very small and nearly obsolete.

E. ottoe Edwards.

I have seen two males and two females in the Strecker collection from Utah. The marginal band is nearly obsolete, yet serves to define the pale spots.

E. yuma Edwards.

Unknown to me and perhaps in the wrong genus. From the description it must be a very distinct form. Arizona.

E. axius Plotz.

This is added by Mabilie. I do not know it.

Genus **OCHLODES** Scudder.

SYNOPSIS OF SPECIES.

1. Large; wings brown with hyaline spots.....**snowi**.
Smaller; wings largely marked with fulvous..... 2.
2. Stigma of male very oblique, touching vein 1 within basal third
harpalus, sassacus.
Stigma less oblique, touching vein 1 beyond basal third..... 3.
3. Hind wings dark below with contrasting yellow spots.....**pratincta**.
Hind wings pale below, spots not contrasting..... 4.
4. Hind wings immaculate below..... 5.
4. Smaller, dark markings of fore wings confluent.....**nemorum**.
Larger, dark markings of fore wing separated into a border and a discal mark.
agricola, napa.
5. Fore wings with fuscous spot at end of stigma, no translucent spots on costal margin.....**verus**.
Fore wings without fuscous spot at end of stigma and with three translucent spots on costal margin.....**nilo**.

O. snowi Edwards.

* From Colorado and Arizona. This species is aberrant in this genus as there is a very distinct point to the antennal club, almost as long as the width of the club. It might find place near *Amblyscirtes*, but, as it would form a new generic type there, I leave it where Mabile puts it.

O. sassacus Harris.

From the northeastern United States.

O. harpalus Edwards.

Unknown to me. Described as near *sassacus* and, from the description, indistinguishable therefrom. Nevada.

O. pratincola Boisduval.

Inhabits the Pacific coast to British Columbia.

O. nemorum Boisduval.

From California.

O. verus Edwards.

From California; it is like *agricola* above but lacks the spots below. It is probably only a light variety of *agricola*.

O. agricola Boisduval.

From the Pacific Coast, British Columbia, Nevada.

O. napa Edwards.

From Colorado and Washington. I do not believe that this is specifically distinct from *agricola*. It is a little larger only and the markings a very little better defined. Otherwise I see no differences whatever.

O. milo Edwards.

Autoptically unknown to me and perhaps not of this genus, but described as near *agricola*. From Mt. Hood, Oregon.

Genus EPIPHYES, new.

Antennal club cylindrical, the point rather obtuse and about equal to the diameter of the club. Palpi with the third joint moderate, rather slender; wings normal, vein 2 arising at the middle of the cell, 3 before the end. Mid tibiæ spiny. Male stigma a large, ill defined blotch.

Type *Pamphila carolina* Skinner.

E. carolina Skinner.

From North Carolina.

Genus **LEREMA** Scudder.

L. accius Abbot & Smith.

Inhabits the Southern States. Dr. Skinner thinks that *horus* Edw. from Texas is probably a synonym.

Genus **MASTOR** Godman & Salvin.

SYNOPSIS OF SPECIES.

1. Head and collar golden, fringe sordid pale.....**phylace**.
Head, collar and fringe golden.....**bellus**.

M. bellus Edwards.

From Arizona.

M. phylace Edwards.

New Mexico. I have seen two specimens in the Strecker collection.

Genus **ATRYTONOPSIS** Godman & Salvin.

SYNOPSIS OF SPECIES.

1. Hind wings immaculate above..... 2.
Hind wings with fulvous or hyaline spots..... 5.
2. Larger species, fringe of hind wings white..... 3.
Smaller species, fringe of hind wings not white.....**hianna**.
3. No hyaline spot at the end of the cell of fore wings.....**deva**.
A hyaline spot at the end of the cell..... 4.
4. Brown, the discal spot lunate.....**lunus**.
Grayer, the discal spot more erect.....**vierecki**.
5. Hind wings with a straight row of whitish hyaline spots**pittacus**.
Hind wings with an irregular row of spots, accompanied by others below..... 6.
6. Spots yellow hyaline; stigma faint, straight..... **python**.
Spots white hyaline; stigma bent, oblique, distinct.....**cestus**.

A. deva Edwards.

From Arizona.

A. lunus Edwards.

From Arizona. I have seen none but females of this species but suppose it properly referred here.

A. vierecki Skinner.

From New Mexico. I have examined the types in the collection of the Academy of Nat. Sci. at Philadelphia. The species looks like a faded *lunus*, but the color is evidently natural.

A. hianna Scudder.

Occurs in the northern Atlantic States.

A. pittacus Edwards.

From Arizona.

A. python Edwards.

From Arizona.

A. cestus Edwards.

From Arizona.

Genus THESPIEUS Godman & Salvin.**T. macareus Herrich-Schaeffer.**

Reported from our southern border.

Genus STOMYLES Scudder.

SYNOPSIS OF SPECIES.

1. Hind wings below with spots joined by the pale veins.....**textor**.
Hind wings below with pale spots on a dark ground..... 2.
Hind wings below immaculate.....**fusca**.
2. Spots of fore wings dislocated, the 4th of the row below the cell well beyond the subapical row..... 3.
Spots of fore wing in a curved row..... 4.
3. Larger species, expanse 25 mm.....**comus**.
Smaller species, expanse 20 mm.....**hegon**.
4. Hind wings below with base and margin grayish, middle field brown with diffuse pale spots.....**arabus**.
Ground color of hind wings below uniform..... 5.
5. Hind wings below brown, grayish irrorate.....**celia**.
Hind wings below brown, yellow bronzy**nereus**.

S. textor Hübner.

Occurs in the Southern States, North Carolina, Florida.

S. celia Skinner.

From Texas. The male stigma consists of a slight thickening along the outer section of the median vein and base of vein 2. In another specimen it extends out a little between the fork of these veins, suggesting the form shown by *zenus* and *sinus*. The species therefore approaches the genus *Amblyscirtes*.

S. nereus Edwards.

I have only a single worn female from the Huachuca Mountains, Arizona, named by Dr. Barnes, so I cannot vouch for the generic position in the absence of a male.

S. hegon Scudder.

One male is before me from Texas, labelled *samoset* by Mr. Belfrage.

S. comus Edwards.

Unknown to me. I see nothing in the description to separate this from *hegon* except the larger size. From Texas.

S. arabus Edwards.

Arizona. One specimen in the Strecker collection. It much resembles the South American *odilia* Berg.

S. fusca Grote & Robinson.

From the Southern States, New York to Georgia. The male stigma is practically obsolete, though I think I see a trace of it. The species might be placed in *Lerodea*.

Genus AMBLYSCIRTES Scudder.

SYNOPSIS OF SPECIES.

1. Hind wings with small white spots below in a circle..... 2.
Hind wings not so marked..... 3.
2. Larger species; third joint of palpi smaller..... *nanno*.
Smaller species; third joint of palpi longer..... *elissa*.
3. Hind wings without white spots above, at most an obscure fulvous band..... 4.
Hind wings with white spots above..... *eos*.
4. Wings black with white costo-apical dots..... 5.
Wings more or less bronzy, spots fulvous or obsolete..... 7.
5. Hind wings below whitish and purple irrorate, without band..... 6.
With an irregularly mottled dark central band..... *nysa*.
6. Marks below purplish, forming a distinct outer border..... *vialis*.
With pale irrorations on a dark ground only..... *meridionalis*.
7. Marks on wings above nearly obsolete..... *oslari*.
Marks on wings above forming distinct fulvous spots..... 8.
8. Band of spots broken, no spot in the interspace 5-7..... *ænus*.
Band of spots continued around cell..... 9.
9. Male stigma small, nearly obsolete..... *simius*.
Male stigma large, well developed..... *cassus*.

A. nanno Edwards.

From Arizona.

A. elissa Godman & Salvin.

Reported from our southern border.

A. vialis Edwards.

Inhabits the northern United States, New York, Pennsylvania, Washington, British Columbia.

A. meridionalis, new species.

Like *vialis* above, but the spots whiter and smaller. On under side of hind wings there is only a faint purplish irroration on a brown ground, faintly showing a discal dot and outer band in pale scales. Described from three specimens in the Strecker collection from Georgia and Florida, labelled *Amblyscirtes eos*. It may be a southern form of *vialis*. The three specimens are uniform.

A. nysa Edwards.

From Texas and Arizona.

A. eos Edwards.

From Arizona.

A. ænus Edwards.

From Colorado and Arizona.

A. oslari Skinner.

Dr. Skinner has loaned me his male type from Colorado. I have a male like it from Arizona that has stood under the label *ænus* for years. Also a pair recently received from the Huachuca Mountains, Arizona, collected August 20, 1903, by Mr. E. J. Oslar.

A. simius Edwards.

Colorado. I have examined two specimens in the Strecker collection.

A. cassus Edwards.

From Arizona.

Genus *PARATRYTONE*, new.

Antennæ with the club slender, the point bent, tapered, longer than the width of the club. Palpi with the third joint short, thick; middle tibiæ spined. Vein 2 arising before the middle of the cell; male with a narrow, straight stigma from vein 3 to vein 1, broken on vein 2.

Type. — *Pamphila howardi* Skinner.

SYNOPSIS OF SPECIES.

1. Male stigma heavy, black; dark border of fore wings faint.....*scudderi*.
Male stigma delicate, grayish; dark border of fore wings distinct..... 2.
2. Larger; black marks heavier, spot beyond cell touching the discal arc....*howardi*.
Smaller; black marks less defined, the spot beyond the cell not touching the discal arc.....*aaroni*.

P. scudderi Skinner.

Dr. Skinner has kindly loaned me his male and female types. He has associated the species with the *comma* group (genus *Erynnis*); but this is negated by the long point of the antennæ which is fully as long as the width of the club. The types are from the White River, Colorado.

P. howardi Skinner.

From Florida.

P. aaroni Skinner.

From New Jersey. This will probably prove to be not speci-

cally distinct from *howardi* when we have specimens from the other southern states.

Genus POANES Scudder.

P. massasoit Scudder.

From the Atlantic states.

Genus PHYCANASSA Scudder.

P. viator Edwards.

From the Atlantic states, common southward.

Genus CALPODES Hübner.

C. ethlius Cramer.

From Florida and Texas, the larva on *Canna*.

Genus ATRYTONE Scudder.

SYNOPSIS OF SPECIES.

- | | |
|--|------------------|
| 1. Fore wings of the male with the disk broadly fulvous..... | 2. |
| Fore wings of the male with the disk brown with fulvous spots..... | <i>melane</i> . |
| 2. Hind wings below brown with a large yellow patch..... | <i>hobomok</i> . |
| Hind wings below yellow with a subbasal brown band..... | 3. |
| 3. Smaller; the band below usually continuous..... | <i>zabulon</i> . |
| Larger; the band below broken into spots or obsolete..... | <i>taxiles</i> |

A. melane Edwards.

From southern California.

A. hobomok Harris.

Inhabits the Atlantic states.

A. zabulon Boisduval & Leconte.

Inhabits the Atlantic states.

A. taxiles Edwards.

Inhabits the western United States.

Genus LERODEA Scudder.

I am unable to separate the genus *Oligoria* Scudder from *Lerodea*, and I, therefore, unite them.

SYNOPSIS OF SPECIES.

- | | |
|--|-------------------|
| 1. Hind wings with distinct white spots below..... | 2. |
| Hind wings without white spots below..... | 3. |
| 2. Spots in a median row only..... | <i>maculata</i> . |
| Spots in a median angled row and subbasal ones also..... | <i>loammi</i> . |
| 3. Hind wings below brownish with traces of outer pale band..... | <i>eufala</i> . |
| Hind wings below cinereous, longitudinally streaked..... | <i>osyka</i> |

L. loammi Whitney.

From Florida. Three specimens in the Strecker collection.

L. maculata Edwards.

From Florida.

L. eufala Edwards.

From Florida. Mabilie refers his *florida* (Bull. 52, U. S. Nat. Mus., no. 470), as a synonym of this.

L. osyka Edwards.

From Texas and Mexico (Oxaca, L. O. Howard).

Genus EUPHYES Scudder.

SYNOPSIS OF SPECIES.

1. Fore wings of male with hyaline white spots.....**verna**.
Fore wings of male black, immaculate.....**metacomet**.
- E. verna** Edwards.
From the eastern United States.
- E. metacomet** Harris.
From the eastern United States.

Genus LIMOCHROES Scudder.

SYNOPSIS OF SPECIES.

1. Hind wings immaculate below..... 2.
Hind wings with pale spots below..... 6.
Hind wings dark below, veins pale, a fulvous ray above angle.....**streckeri**.
2. Fore wings dark above, scarcely fulvous washed..... 3.
Fore wings with distinct fulvous discal area..... 4.
3. Smaller; black border of fore wings reaching over half way to stigma.
bimaculata.
Larger; black border scarcely reaching half way to stigma.....**arpa**.
4. Stigma thick, heavy, scarcely divided..... 5.
Stigma narrower, more obviously divided.....**byssus**.
5. Fore wings with the cell to costa fulvous.....**palatka**.
Fore wings with the costa washed with fuscous.....**dion**.
6. Stigma joined to the margin by fuscous; hind wings with little or no fulvous
manataaquae.
Stigma separated from the marginal band by fulvous; hind wings with a fulvous
patch.....7.
7. Yellow discal spot of hind wings separated from base by fuscous.....**pontiac**.
Yellow discal spot nearly reaching base over cell.....**yehl**.
- L. bimaculata** Grote & Robinson.
From the Atlantic States.

- L. arpa* Boisduval & Leconte.
From Florida.
- L. byssus* Edwards.
From Florida.
- L. palatka* Edwards.
From Florida.
- L. dion* Edwards.
From the eastern United States.
- L. manataqua* Scudder.
From the eastern United States.
- L. pontiac* Edwards.
From the eastern United States.
- L. yehl* Skinner.
From Tennessee.
- L. streckeri* Skinner.

The single type from Florida is in the Strecker collection. The antennæ are broken and both middle legs lost, so that its true generic position is open to question. I place it provisionally in *Limochroes*; it may be found referable to *Paratrytone*.

Genus PRENES Scudder.

SYNOPSIS OF SPECIES.

1. Large species, no yellow lining on the veins of hind wings below.....2.
Smaller species with more or less distinct yellow lining.....3.
 2. Hind wings immaculate below.....*ocola*.
With a row of small bluish white spots on costal half.....*nero*.
With an outer and basal pale band, a black spot below costal vein.....*ares*.
 3. Hind wings below with two large white dashes.....*panoquin*.
Hind wings with three little white dots between the veins.....*panoquinoides*.
Hind wings below with obscure yellowish dots; veins distinctly lined*errans*.
- P. ocola* Edwards.
From Florida.
- P. nero* Fabricius.
Reported from our southern border.
- P. ares* Felder.
Reported from our southern border.
- P. panoquin* Scudder.
From the southern Atlantic States.

P. panoquinoides Skinner.

From the Florida Keys.

P. errans Skinner.

From southern California.

Genus ANATRYTONE, new.

Club of antennæ cylindrical, the tip about as long as the width of the club, rather obtusely pointed. Wings normal, vein 2 arising near the middle of the cell, 3 close to the end. No sex mark in the male. Third joint of the palpi moderate, obtuse. Mid tibiæ without spines or a very few minute ones.

Type. — *Pamphila delaware* Edwards.

Godman and Salvin place this species in *Atrytone*; but the nearly complete absence of the spines on the middle tibiæ has induced me to remove it therefrom.

SYNOPSIS OF SPECIES.

1. Fore wing of male more or less black lined on the veins.....2.
Fore wing without black lining on the veins.....3.
2. No black patch beyond cell.....*delaware*.
With a blackish patch beyond the cell.....*vitellius*.
3. Wings broadly black bordered.....*arogos*.
Wings very narrowly black bordered.....*lagus*.

A. delaware Edwards.

Southern States, Nebraska.

A. vitellius Fabricius.

I do not know whether we have this species. Dr. Skinner unites it with *delaware*, but Godman & Salvin point out differences.

A. arogos Boisduval & Leconte.

From the Southern States, Florida, Kansas.

A. lagus Edwards.

From Texas.

Genus PADRAONA Moore.

P. dara Kollar.

The species has been recorded from West Virginia, Colorado and California, but it is not certain that it really occurs with us; Dr. Holland argues that the records may be erroneous (Journ. N. Y. ent. soc., vi, 57, 1898). The genus occurs in America, as Mabille records two species from South America; but it will be a unique record if an Asiatic species, not known in Europe, proves to be widely scattered over North America.

Subfamily MEGATHYMINÆ.

Genus MEGATHYMUS Scudder.

SYNOPSIS OF SPECIES.

1. Hind wings with the outer margin yellow.....2.
Hind wings with the outer margin black.....4.
2. A white angled patch on subcostal vein below; male without erect hairs...*yuccæ*.
No such white patch below; male with long erect hairs on the hind wings.....3.
3. Males with the hairs long; females with the dislocated spots of veins 4-6 large
streckeri.
Males with the hairs shorter; females with these spots small.....*cofaqui*.
4. With yellow spots on the hind wings above.....5.
Without such spots.....*ursus*.
5. Fore wings with submarginal fulvous band.....*neumoegeni*.
Fore wings with the band cut into spots by black veins.....*aryxna*.

M. yuccæ Boisduval & Leconte

Southern Atlantic states, the larva in the roots of *Yucca*. Mabille thinks that *coloradensis* Riley is a distinct species, but I am unable to separate it except by the size.

M. cofaqui Strecker.

From Texas.

M. streckeri Skinner.

Texas, Colorado. Not well separated from the preceding.

M. neumoegei Edwards.

From Arizona. Types are in the Neumoegen and Strecker collections and have extensive confluent fulvous markings. The figure in the *Biologia* represents a differing form which has been generally erroneously identified as *neumoegeni*.

M. aryxna, new species.

This is the form figured in the *Biologia Cent.-Am. Lep. Het.*, III, pl. 69, figs. 3 and 4. It differs from *neumoegeni* in having the fulvous markings considerably reduced, the outer band being broken into spots. I have ten specimens from Arizona from Dr. Barnes and Mr. Poling.

M. ursus Poling.

Arizona. Known only in the female.

NOTES ON THE LARVÆ OF THE HESPERIIDÆ.

The larvæ of the North American Hesperiidæ have been much neglected, yet they offer a very interesting field for study. Of the foregoing species, only about forty have any larval observations published. Mr. W. H. Edwards, who has made known the life histories of so many North American butterflies, never seriously undertook the study of those of the Hesperiidæ, to our great loss.

The larvæ possess primitive setæ in the first stage with the generalized arrangement (Trans. N. Y. Acad. Sci., xiv, 52, fig. 3, 1895). After the first molt these are replaced by a coat of fine secondary pile. The neck is almost always small, the body is thickened centrally and tapers to the extremities. The feet are of the normal number.

After the first molt, when the primitive first stage is lost, there is usually very little change in the larva in structure or coloration, except the usual development of the markings. But one instance is known to me of marked change at the last molt, that of *batabano*. In this insect the larva is transformed at the last ecdysis from a smooth wine-red with bright yellow bands, to frosted white pitted by the non-pruinose areas about the setæ.

The relationships to the other families have been briefly stated by me (Ann. N. Y. Acad. Sci., viii, 231, 1894; Trans. N. Y. Acad. Sci., xiv, 61, note, 1895).

The food plants of the species are not as diversified as usual, grass and allied plants forming the food of many of the Pamphilinæ. The other groups feed on more various plants. None of the species known to me are general feeders or have any approach to such a habit; *tityrus* feeds on several plants, but they all belong to the pea family.

The larvæ almost invariably construct some shelter by spinning together leaves or parts of them into a box-shaped retreat. This is usually the first business of the newly hatched larva and the notches with the bitten part folded over formed in the edges of bean leaves by *proteus* or *tityrus* are characteristic of many other species. The larvæ of *Megathymus* are borers in the roots of *Yucca*, which habit has even caused some to think them allied to the Castniidæ, although the larvæ themselves really have no affinity therewith.

We hope that more study will be devoted to these larvæ in the future.

Class I. HEXAPODA.

Order IX, HEMIPTERA.

THE GENUS NOTONECTA IN AMERICA NORTH OF MEXICO.

BY J. R. DE LA TORRE BUENO,
NEW YORK, N. Y.

(PLATE VII.)

The Notonectidæ are one of the most interesting and, as far as coloration goes, handsomest families of the Cryptocerate Hemiptera, while the genus of which I treat is certainly the most brilliant in hues, nearly every species being of some striking color. But, as I have pointed out on other occasions,* these are much neglected groups, and while some little work has been done in Europe in past times by the great masters F. X. Fieber, G. Mayr, Léon Dufour and others, and of late years by their learned successors, George W. Kirkaldy and Prof. A. L. Montandon, specialists in these families, in America nothing has been produced to compare with their work, save, perhaps, by Prof. Uhler, who is easily the premier American Hemipterist. Yet even he has taken up these neglected groups only as they came within the general scope of his specialty. The other Heteroptera are studied with greater or less closeness in proportion as they are hurtful or harmless, and most of them receive the special attention of the economic entomologist, but the aquatic forms are little collected and still less studied. Nevertheless, there is an economic aspect to these groups. Being predaceous, they are useful or harmful according to their prey. The great water-bugs of the family Belostomidæ are stated by Uhler,† Howard‡ and others§ to be harmful where pisciculture is practised, as they are destructive to young fish. May not

* "Notonectidæ of the Vicinity of New York," Journ. N. Y. Ent. Soc., X, 4, 1902. "Brief Notes toward the Life-History of *Pelocoris femorata* Pal. B., with a few remarks on habits," *ibid.*, XI, 3, 1903.

† Standard Natural History, II, p. 256.

‡ Insect Book, p. 278.

§ Proc. Ent. Soc. Wash., III, 2, pp. 87-88.

the Notonectæ likewise destroy such as are sufficiently small to be overcome by them? I have seen nymphs of *Notonecta undulata* Say in the second instar kill and suck the juices of young fish which had just emerged from the egg in my aquaria. Prof. S. A. Forbes's two papers on the food of fresh-water fishes, in the Bulletin of the Illinois State Laboratory of Natural History * show that they are of very little account as fish food. He says (*l. c.*); "Indeed, the true Waterbugs (Hemiptera) were generally rare, with the exception of the small soft-bodied genus *Corixa*, which was taken by one hundred and ten specimens, belonging to twenty-seven species—most abundantly by the sunfishes and top-minnows." Further on in the paper he tabulates the families, and in some instances, species, of insect fish-food, and contrasting with the number of fish above mentioned that ate *Corixas*, only *one* fish was found to have fed on Notonectas, out of the entire number examined.

Because of their apparent lack of economic importance, the knowledge of American forms is very imperfect and but scant information is available regarding their distribution, habits, life-history and anatomy. This I have found at every turn while consulting authorities. For this reason in the following pages I will endeavor to make it possible for anyone to identify with very little trouble any of the species of the genus *Notonecta* that occurs north of Mexico; and by thus facilitating this identification and by pointing out gaps in our knowledge that might readily be filled, especially in distribution, induce others to collect and study a group which I am certain will be found eventually to be of positive economic importance, not only as an enemy in fish-culture, but possibly also in useful ways by the destruction of undesirable aquatic larvæ. The figures illustrating the various species will enhance the value of this paper, being true to nature and showing very perfectly the different physical characteristics of the waterbugs, being drawn to scale and in perfect proportion. They are the work of Mrs. William Beutenmüller, who is, I consider, one of our foremost insect artists. I here wish to express my appreciation of her great kindness in consenting to make these drawings.

The genus *Notonecta* Linné is of world-wide distribution, but appears to be more especially an American group. Of its twenty species

* "Studies on the Food of Fresh Water Fishes," Art. VII, Vol. II. "On the Food Relations of Fresh Water Fishes: A Summary and a Discussion," Art. VIII, Vol. II.

no less than twelve are peculiar to America, the thirteenth being European and Asiatic, also of these thirteen, eleven are to be found north of Mexico, three being, so far as records show, strictly boreal. It is not safe, however, to generalize regarding such variable and little-known insects, since errors readily arise from this practice. The described and recorded North American forms are *Notonecta indica* Linné (= *americana* Fabricius*), *N. undulata* Say, *N. variabilis* Fieber, *N. uhleri* Kirkaldy, *N. mexicana* Amyot & Serville, *N. irrorata* Uhler, *N. lutea* Muller, *N. shooteri* Uhler, *N. insulata* Kirby, *N. montezuma* Kirkaldy, to which I add a new species, *N. howardii*.

Notonecta indica Linné is peculiarly a subtropical form and is found only in the warmer portions of the South and West, while *N. undulata* Say is of the widest distribution, ranging to my knowledge, from as far North as British Columbia and going down as far as Chile in South America, according to Kirkaldy. The distribution of *N. variabilis* Fieber is not so well known, but it is commonly found in the greater part of the United States. The very few recorded captures of *N. uhleri* Kirkaldy make it very difficult to fix its limits, but it is certainly to be found all along the Atlantic and Gulf seaboard of the United States. *N. mexicana* Amyot & Serville is more peculiarly tropical, but it comes in along our Southwestern boundary where the climate is warmer, extending up along the Pacific Slope for some distance, which appears to be the case also with *N. shooteri* Uhler and *N. montezuma* Kirkaldy, while on the other hand *N. irrorata* Uhler seems to be northern and eastern, being found only in the colder sections. In *N. insulata* Kirby we have a very peculiar distribution, the bug being in the East apparently boreal, but in the West it goes down into the warmer portions of the country. In *N. lutea* Muller we have an addition to our fauna, of much interest since the insect has heretofore been recorded only from Europe and Siberia.†

Considering the United States only, I have been unable to find any records of *Notonecta* from the following states: New Hampshire, Vermont, Delaware, West Virginia, South Carolina, Georgia, Mississippi, North Dakota, Alabama, Washington, Wyoming, and Arkansas, and Indian and Oklahoma Territories. The insect must certainly occur in them, since they are found in the neighboring ones. They must, for instance, be found in New Hampshire and Vermont, since

* Kirkaldy gives the Synonymy in "Über Notonectiden."

† Bueno, "A Palearctic *Notonecta*," Entomological News, XV, p. 220, June, 1904.

they occur in Massachusetts, New York, Maine, and the province of Quebec in Canada. I trust these gaps will be filled before long.

The habits of the Notonectæ are more or less well-known. They are exceedingly active and fiercely predaceous, resembling nothing so much as hawks among vertebrates. Their principal prey are such unfortunate insects as fall into the water within the ken of the watchful waterbug, or such of the feebler aquatic insects they can overcome, not disdaining their own young. From their position hanging back down at or near the surface, nothing escapes them, and at the slightest vibration imparted to the water by any struggling insect, or the least motion of one swimming by, they wheel swiftly about and with one or two powerful strokes of their long swimming legs, are on their prey and have it seized in their strong raptorial first and second pair of legs. They are strong and vigorous swimmers, and it is no great effort for a *Notonecta*, to pull under water and swim away with a struggling insect at least its own size, if not larger. I have, as before noted, seen a young nymph swim away with a fish at least twice its own size. Not all Notonectas hang from the surface constantly, however. *Notonecta undulata* does, and its raptorial claws can be seen forming little elevations as it hangs head down, while *N. insulata* seems to prefer to float in clear spaces in clean cold pools, about midway between the bottom and surface. On the other hand, *N. irrorata* and *N. uhleri* appear to like to hide among the roots of plants growing at the water's edge, to which they cling. The former may at other times also be seen floating below the surface in the shadow cast by bank or fallen tree or broken branch. The habits of *N. variabilis* differ somewhat from the others, since this bug prefers to lurk among the water weeds at the bottom.

The oviposition of *Notonecta* has thus far been always described from Régimbart's paper* and the statement that the ova are buried in the stem of a plant has been handed down from generation to generation of entomologists as a precious heirloom, without question and without doubt. However, out of about 1,300 or 1,400 ova of four or five species that I have seen, some deposited in my aquaria and others taken in nature, I have thus far not found this so, save in the instance of one *N. undulata*, which did indeed insert them quite deeply in the stem of a water weed. All the others were simply

* "Observations sur la Ponte du *Dytiscus marginalis* et de quelques autres Insectes Aquatiques," Ann. Soc. Ent. Fr., 1875, p. 204.

attached in the manner described further on, although the plants in my aquaria were the same as for the one specimen, and although in the open I have found the ova on the watersoaked and decaying stems of rushes. It may well be, nevertheless, that since the bug observed by Régimbart was the European *Notonecta glauca* Linné its habits in this respect may differ from those of the American species I have been able to observe.

A word regarding collection and preservation of these waterbugs may not be amiss. Any approved water net will do. I use one made of coarse Brussels net, which is very strong and at the same time permits the water to flow through quickly, thereby offering very little resistance in the rapid movements necessary to secure these agile swimmers. The handle also should be rather long to give a good reach. To capture *Notonecta undulata*, the net should be moved swiftly back and forth just under the surface of the water at first; then when the bugs are hiding the vegetation should be dragged, the latter being also the best way to get *N. variabilis*. *Notonecta uhleri* and *N. irrorata* are best taken by dragging along the vegetation growing into the water from overhanging banks, not too near the surface, a tangle of roots in the water being in my experience the best place. For *N. irrorata*, the shadow of logs or broken branches lying in the water is a very favorable situation, and if the log lies in the water or floats on it the net should scrape the submerged surfaces. *Notonecta insulata* can be taken as it floats in the water by approaching the net slowly to the insect and then making a swift stroke, so that it meets the bug as it swims away. When under cover, the vegetation should be dragged as for the others. Not being familiar with the habits of the other species enumerated I can give no definite idea as to the best ways to catch them, but should think that some one of the preceding methods would apply.

The cyanide bottle is, of course, the most satisfactory way of killing them. *On no account should they be killed in alcohol.* This fluid distorts and discolors them, making them unfit for mounting. However, as a preservative of specimens for anatomical purposes, it is possibly the best. Formalin is not good; as while it preserves the insect, it so hardens the tissues that they become extremely brittle, even when wet. For mounting on pins, when it is not possible to do it in the field or for the moment, the water bugs should be kept dry, being put between layers of cotton protected by soft tissue paper, this

being also the best way of packing them for transportation. To soften them, they can be put with perfect safety into a little cold water, and in the course of an hour or so they will be sufficiently relaxed to be pinned without danger of breaking off legs, etc.

Living *Notonectæ* for breeding or study should be put in a clean, dry tin box with a little excelsior in it to give them something to cling to, so they may not be too much shaken about or huddled together, which wets them and seems to be otherwise hurtful to them. It is wise also to put in with them a small piece or two of moist waterweed, which seems to help to preserve them in good condition till the aquaria can be reached. When in captivity, they should be fed on living flies or other small insects, which can be dropped into the water near them. One or two flies a day apiece appear to be enough to keep them in good condition.

In preparing the list of distribution I have consulted the papers indicated in the appended bibliography, and they will be denoted by the number each title bears in this list, which follows each locality. Other sources will be denoted by name.

The genus *Notonecta* is peculiar for the lack of a sufficiency of fixed diagnostic characters to facilitate the separation of the species by means of tables. Color is unreliable to a degree, varying as it does with locality, age, condition, or even without any assignable cause in the same species. For instance, the general coloration of *Notonecta undulata* Say, our most common and widespread species, varies from pure white with yellow scutellum, greenish feet and claret-colored eyes, to an entire black color, the feet and eyes remaining the same, and the scutellum being also black, with gradual and almost imperceptible intergrades from one to the other form. Occasionally, *N. variabilis* Fieber is found with black fasciæ corresponding to those of *N. undulata*, to such a degree that it may be taken for a dwarf form of the latter. In view of this, Kirkaldy has proposed as a diagnostic characteristic the proportion of the distance between the eyes at the front, which he has called the vertex, to the distance between the eyes at the base of the head, at the most constricted part, which he has denoted by the term *synthlipsis*. In practice, and I have made hundreds of measurements, I have found this proportion to hold good in each species within very narrow limits of variation; and in connection with the length of the insect and the proportional length and breadth of the pronotum and scutellum, it affords an excellent means

for separating them. I have used this method in the diagnostic tables following, being of the opinion that in general, proportional measurements of the hardened chitinous skeleton will be found to be constants in the majority of insects, and being more permanent than other characters, give an at all times reliable standard for the separation of species. This theory has not had the test of extended practical experience, except in this group, where hundreds of measurements have born out its efficiency.

Analytical Tables.

Family NOTONECTIDÆ.

Rostrum 3- to 4-jointed, first pair of legs inserted on the posterior margin of the pronotum, scutellum large.

KEY TO THE SUBFAMILIES.

Hind tibiæ and tarsi ciliated, abdomen keeled, hairy, eyes very large, conspicuous.

Notonectina.

Hind tibiæ and tarsi apparently not ciliated, abdomen neither keeled nor hairy, rostrum 3-jointed, eyes small.....*Pleina.*

Subfamily NOTONECTINÆ.

KEY TO THE GENERA.

Eyes not contiguous at base, posterior femora not reaching the apex of the hemelytra.

Pronotum not very transverse, wings present, hemelytral area distinct.

1 (2) Last segment of the antennæ much shorter than penultimate, hind tarsi without claws*Notonecta.*

2 (1) Last segment of the antennæ much longer than the penultimate, hind tarsi with claws*Buenoa.*

Genus NOTONECTA Linné.

SYNOPSIS OF SPECIES.

1 (7 and 10) Small species, subrobust.

2 (5) Vertex twice or less than twice the synthlipsis.

3 (4) Vertex $1\frac{1}{2}$ to two times the synthlipsis; width of pronotum one and three quarters times the length; width of scutellum one and one half times the length; length of insect 9.4 mm. to 11 mm. *indica.*

4 (3) Vertex twice the synthlipsis; width of pronotum one and four fifths times its length; width of scutellum one and one fifths times its length; length of insect 10.2 mm*howardii.*

5 (2) Vertex more than twice the synthlipsis.

6 Vertex two and one half times the synthlipsis; width of pronotum twice its length; width of scutellum one and one fifth times its length; length of insect 10 to 13 mm*undulata.*

7 (1 and 10) Small slender species.

8 (9) Vertex three times the synthlipsis; width of pronotum twice its length;

- width of scutellum one and one third times its length; length of insect 8.2 to 10.2 mm **variabilis.**
- 9 (8) Vertex six to eight times the synthlipsis; width of pronotum one and four fifths times its length; width of scutellum one and one sixth times its length; length of insect 10.7 to 12 mm **uhleri.**
- 10 (1 and 7) Medium-sized robust species.
- 11 (14 and 17) Vertex at least three times the synthlipsis.
- 12 (13) Vertex three to four and one half times the synthlipsis; width of pronotum two and one half times its length; width of scutellum one and one half times its length; length of insect 11 to 14 mm. **mexicana.**
- 13 (12) Vertex three times the synthlipsis; width of pronotum twice the length; width of scutellum one and one quarter times its length; length of insect 12.1 to 14.4 mm **irrorata.**
- 14 (11 and 17) Vertex less than three times the synthlipsis.
- 15 (16) Vertex two to two and one half times the synthlipsis; width of pronotum twice the length; width of scutellum one and one fifth times the length; length of insect 12.1 to 17 mm **lutea.**
- 16 (15) Vertex two and one half times the synthlipsis; width of pronotum one and six sevenths times its length; width of scutellum one and one fifth times its length; length of insect 13.1 to 14 mm. **montezuma.**
- 17 (11 and 14) Vertex not twice as wide as synthlipsis.
- 18 (19) Vertex one and one third times the synthlipsis; width of pronotum one and two thirds times its length; width of scutellum one and one third times its length; length of insect 8 to 13 mm. **shooterii.**
- 19 (18) Vertex but slightly wider than synthlipsis; width of pronotum twice the length; width of scutellum one and one fifth times the length; length of insect 12.6 to 15.5 mm **insulata.**

1. *Notonecta indica* Linné.

Notonecta indica.

1771. Linné, "Mantissa Plantarum," p. 534.
 1900. Kirkaldy, "Entomologist," p. 10.*
 1904. Kirkaldy, "Über Notonectiden," Wien. Ent. Zeit., p. 94.

N. americana.

1775. Fabr., Syst. Ent., p. 690, etc.*
 1811. Ol., Enc. Méth., VIII, p. 389.*
 1886. Uhler, Ch. List, p. 28.
 1894. Uhler, P. Z. S., Lond., p. 223.
 1897. Kirk., Rev. Not., Tr. Ent. Soc. Lond., p. 408.
 1901. Champ., Biol. C.-A., Rhynch. II, p. 370, Tab. 22, fig. 11, female.

N. unifasciata.

1857. (?) Guérin, Le Moniteur, p. —.*
 1858. Guérin, Bull. Soc. Zool. Acclim., IV, p. 581.
 1897. Kirk., Tr. Ent. Soc. Lond., p. 426.

Description. — "Head rather large, notocephalic lateral margins straight, not very divergent from the base; vertex varying from one and one half to twice as wide as synthlipsis. Scutellum rather shorter than in *N. undulata* Say. Hemelytra variable: (1) fulvous or dark stramineous, with a broad black fascia near the apex, occupying the basal two thirds of the membrane and the apex of the corium; (2) varying from bluish black to violet brown, the corial margins of the clavus and a broad irregular blotch about the middle of the corium, fulvous or dark stramineous. Otherwise like *N. undulata* Say." (Kirk., Rev. Not., p. 409.)

Long., 9.4 to 11 mm., lat., 3.4 to 3.6 mm.

Distribution. — United States (49), St. George, Utah (coll. mea), Humboldt Lake, Nevada (coll. mea and Van Duzee), Keeler Co., California (coll. Van Duzee), Arizona (coll. Heidemann and U. S. N. M.), Los Angeles, California (U. S. N. M.), Claremont, California (coll. mea), Rogue River, Oregon (U. S. N. M.), Alpine, Texas (O. S. U. coll.). This bug is extremely abundant in Lake Texcoco, Mexico, where its ova together with those of one or two Corixas are used as food under the name of "hauitle." It also occurs in Cuba, according to Kirkaldy.

The notocephalon, in conjunction with the size and coloration, will in the majority of cases serve to separate *Notonecta indica* Linné from *N. undulata* Say. As to color, however, there are some individuals from California in the U. S. National Museum collection, that of Mr. E. P. Van Duzee and my own, of the pure moonlight color of *N. undulata* var. *maculata*, from which, however, they are separated by the cephalic and pronotal structure. The Los Angeles *N. indica* grade from the typical broad black band across the corium to pure white, being in this somewhat similar to the variations in *N. undulata*. The average length of the insect is about 10 mm., although Kirkaldy gives it as ranging to 11 mm., and in the National Museum there is one specimen that measures only 9.4 mm.

2. *Notonecta howardii*, new species.

Head. — Notocephalic lateral margins curved; vertex twice as wide as synthlipsis; base of eyes about twice as wide as synthlipsis. Pronotum four fifths broader than long, humeral and lateral margins sinuate. Scutellum one fifth longer than wide, not concolorous. Hemelytra clouded with black going into smoky, and with a broad black band across the membrane and the apex of the corium. Apex of the membrane smoky. Corium and clavus moderately clothed with a golden pubescence. Membrane lobes subequal. Pedes: Intermediate femoral spur small, rather blunt, concolorous.

Measurements. — Vertex, 1 mm.; synthlipsis, .5 mm.; pronotum, lat., 3.5 mm., long., 1.9 mm.; scutellum, lat., 2.7 to 2.9 mm., long., 2.2 to 2.4 mm.; insect, long., 10.2 mm., lat. (pron.), 3.5 mm.; types, No. , U. S. N. M.

Described from two specimens in the U. S. National Museum, collected by Dr. E. A. Mearns in Arizona.

This waterbug is intermediate between *Notonecta indica* Linné and *N. undulata* Say. From the former it may be distinguished at once by the head characters; and the pronotum and scutellum will serve to separate it from the latter.

The preceding description is perforce very brief, as there were only the two somewhat old specimens to draw it up from, and I did not venture to spread the wings or otherwise prepare them for fear of destroying the insect. The colors are not mentioned (except black), as they change in old specimens and those preserved in alcohol; and the living or freshly caught insect may be very different in hue from those before me. Color characters, as pointed out in the introduction, are unreliable and misleading.

It affords me sincere pleasure to dedicate this, my first described insect, to Dr. L. O. Howard, to whom I am indebted for many kindnesses and much goodwill.

3. *Notonecta undulata* Say.

Notonecta undulata.

- 1832. Say, Descr. n. sp. Het. Hem., N. A., Fitch reprint, p. 812 LeComte Ed. Comple. Writ., 1859, p. 368, vol. I.
- 1851. Fieb. Rhynchographien, p. 55 (of separate).
- 1851. Fieb., Gen. Hydroc., p. 26 (of separate).
- 1874. Packard, Half hrs. w. Insects, pt. 5, pp. 139-41, fig. 103; ova, p. 159.
- 1875. Uhl., Bull. U. S. Geol. Surv. (2), V, p. 239, pl. 2, fig. 33.*
- 1876. Glover, Ms. Notes, p. 54, pl. V, fig. 9.
- 1877. Uhl., Bull. U. S. G. & G. Surv., Bull., vol. 3, No. 2, p. 453.
- 1878. Uhl., Bull. U. S. G. & G. Surv., vol. IV, p. 509.
- 1878. Uhl., Proc. Bost. Soc. N. H., vol. XIX, p. 442.
- 1883. Packard, Guide, p. 537.
- 1885. Uhl., Stand. N. H., vol. II, p. 252 (partim).
- 1886. Uhl., Ch. List, p. 28 (partim).
- 1888. Comstock, Introduction, p. 186, fig. 157.
- 1889. Weed, Bull. Ohio Agr. Sta., Tech., Ser. I, p. 12, pl. 1, fig. 3.
- 1889. Garman, Bull. Ills. Laby. N. H., art. IX, vol. III, p. 174.
- 1891. Summers, Bull. Agr. Exp. Sta., U. of Tenn., vol. IV, No. 3, p. 82.
- 1890. Hyatt & Arms, Insecta, p. 121, fig. 70.
- 1894. Uhl., Proc. Calif. Acad. Sci., 2, vol. IV, p. 292.
- 1894. Van Duzee, Bull. Buff. Acad. Nat. Sci., vol. V, No. 4, p. —.
- 1895. Gillette & Baker, Bull. 31, Colo. Agr. Exp. Sta., Tech. Ser. I, p. 63.
- 1897. Kirk., Tr. Ent. Soc. Lond., p. 410.
- 1897. Smith, Ins. N. J., p. 144.
- 1899. Packard, Ent. for Beginners, p. 83.
- 1899. Comstock, Manual, p. 130, fig. 49.
- 1900. Osborn, Contr. Dep. Zool. and Ent. O. S. U., No. 2, p. 79.

1900. Luggler, Bull. 69, Ent. Div., U. of Minn., Agr. Coll. Exp. Sta., p. 15.
 1901. Champion, Biol. C.-A., Rhynch., vol. II, p. 370, tab. 22, fig. 10, male
 1901. Howard, Insect Book, p. 275.
 1902. Bueno, Jour. N. Y. Ent. Soc., vol. X, pp. 231 and 233.
 1904. Kirk., Wien. Ent. Zeit., pp. 94, 95 and 132.
 1905. Bueno, Jour. N. Y. Ent. Soc., vol. XIII, p. 45.

N. americana.

1789. Gmel., in Linné Syst. Nat., ed. XIII, p. 2118.*
 1853. Herr.-Sch., Wanz. Ins., IX, p. 44, pl. 294, fig. 902 (nec Fabr).*

N. punctata.

1851. Fieb., Abh. Bohm. Ges. Wiss. (5), VII, p. 476 (in part).
 1886. Uhl., Ch. List, p. 28.

N. variabilis.

1851. Fieb., l. c., p. 477 (in part).
 1856. Guér., in La Sagra's Hist. de Cuba, vol. VII, p. 176.*

N. virescens.

1852. Blanch., in Gay's Chile, Zool., vol. VII, p. 233.*

N. pallipes.

1881. Leth., Ann. Soc. Ent. Belg., vol. XXV, p. 13 (nec Fabr.).

Description. — "Head diverging curvedly (varying in degree) from the synthlip-sis, which is not quite two and a half times less wide than the vertex. Pronotum very similar to that of *N. glauca* Linné, but the humeral margins as a rule not distinct. Scutellum not quite one fourth shorter than the metanotum, varying in color from pale luteous to black, with divers intermediate arrangements of the two colors; similar hemelytral markings occurring with dissimilarly colored scutella and vice versa. Metanotum varying from luteous to black, with three or more dark castaneous stripes; scutellar margin luteous. Hemelytra exceeding variable, giving rise to a number of well-marked varieties, though these are linked together by intermediate forms." (Kirk., Rev., p. 410.)

Long., 10 to 13 mm., lat. 3 to 4 mm.

Distribution. — My collection: Wood's Holl, Mass., Providence, R. I.; Long Island, N. Y., Staten Id., N. Y.; New York City, N. Y.; Putnam Co., N. Y.; Palisades, Rahway R. and Delair, N. J.; Raleigh, N. C.; Baltimore, Md.; Washington, D. C. (also colls. Heidemann and U. S. N. M.); Laval Co., Quebec, Canada; Lake Forest, Chicago and Urbana, Ills.; Onaga and Douglas, Kansas; Paige, Texas; Phoenix, Arizona; Bearfoot Mts., B. C.; Dilley, Oregon; Pasadena, Salton, and Three Rivers, California; Moscow, Idaho (coll. Van Duzee). Collection Heidemann: Maryland, Texas, and St. Kitt's, W. I. Collection U. S. National Museum: Rhode Island, Illinois, Indiana, Kansas, Central Missouri, Virginia; Lincoln, Nebraska; Louisiana, New Mexico, Colorado. Collection Ohio State University: Cedar Bluffs, Nebraska; Ames, Iowa. Albany, N. Y. (Coll. N. Y. State Mus.). Mt. Katahdin, Me. "U. S." (49), Buffalo, N. Y. (53), Madison and Caldwell, N. J. (38), Wauseon and Columbus, Ohio (31); Missouri and Indiana (37); Tennessee (39); Milk River Region, Montana (44); Shasta Co., California (51); Ft. Collins and Denver, Colorado (13); Sloan's Lake, Colorado (42). Minnesota (34); Michigan; Kentucky; Utah.

Notonecta undulata Say is by far the most widely-spread species to be found in America. It ranges from British Columbia down throughout the continent, spreading east and south and ranging down into Chile (according to Kirkaldy, Rev. Not.). The characters given under the preceding species serve to distinguish it from them and from *N. variabilis*, although small, white specimens of *N. undulata* may be confused with the latter. Kirkaldy has proposed three color-varieties for this bug, calling the pure white, or moonlight, color, with a sienna brown dot at the base of the membrane, var. *maculata*; the form with black fasciæ at the junction of the corium and membrane, var. *undulata*; and the fasciated form with corium suffused with black, var. *charon*. While these terms are somewhat useful, it is nevertheless impossible to draw a definite line between the various forms. In a long series, all intergrades are to be found, from the pure white, or moonlight color before mentioned, to an insect nearly all black, except for a little white on the clavus and corium, and a small, nearly round spot at the apex of the corium, next the membrane. There are in the National Museum collection five specimens from Louisiana collected by C. F. Baker, in which a broad black band occupies the posterior portion of the corium and the entire membrane. I have recently received this form from Dr. R. E. Kunzé, from Phoenix, Arizona. Otherwise, it is indistinguishable from the typical insect. Another specimen in the same collection, from Salt Lake, Utah, while having the notocephalic and pronotal structure of this species, in general contour and color may be taken for *Notonecta variabilis*. In the American Museum of Natural History, there is a specimen from Guadalajara, Mexico, which is practically entirely black, varying in tone from deep velvety to brownish black, where in typical specimens the white markings are.

As previously mentioned, this is the most common species of America and easily obtainable at all times. I have endeavored to breed it but have not succeeded in carrying it beyond the second or third instar, owing to the lack of proper food. However, having obtained a number of ova, I give the following description:

Ovum.—Length, 1.9 to 2 mm. Clear glistening pearly white when recently deposited. Chorion sculptured in irregular hexagons. Shape, elongate oval.

The only other descriptions known to me are a brief note by Prof. H. Garman in Bulletin Illinois State Laboratory of Natural History, Vol. III, where on page 174 he says the following: "The

eggs, which are elongated, cylindrical, and white, are attached to aquatic plants." Professor Packard, in "Half Hours with Insects," V, p. 159, also briefly refers to the ovum.

I have seen one *N. undulata* in the act of ovaposition, but not knowing what she was doing until too late, all I noticed was an in and out motion of the terminal abdominal segments, lasting possibly half a minute. When she swam away, there was the pearly white egg. I have frequently noted the parenchyma of the weeds slightly abraded, and in the groove thus formed, the ovum is placed.

4. *Notonecta variabilis* Fieber.

N. variabilis.

- 1851. Fieb., Abh. Bohm. Ges. Wiss. (5), VII, p. 477 (in part).
- 1879. Berg, Ann. Soc. Cien. Arg., VIII, p. 74. (Reprint, p. 197.)
- 1897. Kirk., Tr. Ent. Soc. Lond., p. 414.
- 1902. Bueno, Journ. N. Y. Ent. Soc., vol. X, pp. 231 and 234.
- 1904. Kirk., Wien. Ent. Zeit., pp. 94 and 95.
- 1905. Bueno, Journ. N. Y. Ent. Soc., vol. III, p. 45.

N. undulata.

- 1885. Uhl., Stand. Nat. Hist. vol. II, p. 252 (in part).
- 1886. Uhl., Ch. List, p. 28.

N. americana.

- 1899. Ashm., in Smith's Ins. N. J., p. 144.

Description. — "Head, notocephalic lateral margins diverging curvedly from the narrow base, vertex about three times as wide as synthlipsis. Pronotum, width of posterior margin not quite twice as great as the length of the pronotum. Hemelytra, clear white inclining to yellowish, with a golden pubescence. Alar nervures pale golden yellow. Pedes and abdomen as in *N. undulata* Say." (Kirk., Rev., p. 414.)

Long., 8.2 to 10.2 mm., lat., 3.2 to 3.7 mm.

Distribution. — My collection: Van Cortlandt Pk., Ithaca, Putnam Co., Staten Island, N. Y.; Palisades, Rahway, R., Westfield, and Delair, N. J.; Chestnut Hill, Pa.; Lake Forest, Fourth Lake and vicinity of Chicago, Illinois; Washington, D. C.; Glen Echo and Bladensburg, Maryland; Montreal, Quebec; Raleigh, N. C. Hatch Experiment Station Collection; Amherst, Massachusetts; Pennsylvania, and Maryland. U. S. National Museum Collection: Lake Maxieuche, Indiana, Wisconsin, Michigan, Kansas, Rhode Island. Ohio State University collection: Maine; Columbus and Ashtabula, Ohio; Cedar Bluffs and Pine Ridge, Nebraska.

Notonecta variabilis Fieber is readily distinguishable from *N. undulata* by its smaller size, the largest *N. variabilis* barely equalling the smallest *N. undulata*; by the form being generally more slender; and by the shape of head and proportions of the notocephalon. At times, one meets an individual with black fasciæ somewhat resembling *N. undulata*, but the black is less bright and the markings less clean

cut. The general characters given will serve to separate it in all cases of doubt. There are in my collection some specimens in which the hemelytræ are stained a peculiar brownish black from the water, to a greater or less degree. In the national museum collection, there is a remarkably small specimen from southern California. It approaches in form and size *N. undulata*, var. *virescens*, from which, however, it can be readily separated by the notocephalic structure. It is only 8 mm. long and 2.8 mm. wide.

Prof. Uhler, according to his letters to Mr. Kirkaldy, is of the opinion that this species, *N. undulata* Say, and *N. indica* L. are mere varieties. But on the other hand, I have in my collection long series of both *N. undulata* and *N. variabilis* taken in this locality, and have never met with an intermediate form among them. On the contrary, I have found them always very constant to type. Then again, wherever *N. undulata* was found abundantly, *N. variabilis* was absent; and where I found large numbers of *N. variabilis*, I have taken not more than three or four *N. undulata* altogether. In my opinion, *Notonecta variabilis* Fieber is a good species, entirely distinct from *Notonecta undulata* Say.

The life-history of this water-bug, in common with all others of the family, is unknown. Breeding experiments have given me the ovum, which is very similar to that of *N. undulata*, except that it is naturally smaller, and perhaps a little more slender in proportion. I can also hazard a guess as to the number of stages, from field material and give approximately the period of embryonal development. Oviposition begins early in the spring, and continues thereafter, how late, I am unable to say. The ovum is deposited in a similar manner to that of *N. undulata*, mentioned previously, and the period of incubation is some 22 days on an average; this varies according to the conditions and temperature. Females in my aquaria have deposited some 30 ova each, but this cannot be an exact figure. The bugs arrive at maturity in the late July or early August, as shown by captures of recently transformed individuals. From nymphs taken at the same place on same date, it would appear that there are five nymphal instars, or perhaps, six. The adults pass the winter concealed in the mud at the bottom of the pools they frequent, emerge in the spring as soon as the ice is melted, and immediately begin to breed.

5. *Notonecta uhleri* Kirkaldy.*Notonecta uhleri*.

1897. Kirk., Ann. Mag. N. H. (6), XX, p. 58.*

1897. Kirk., Tr. Ent. Soc. Lond., p. 415.

1902. Bueno, Jour. N. Y. Ent. Soc., vol. X, pp. 231 and 235.

1904. Kirk., Wien. Ent. Zeit., p. 132.

1905. Bueno, Jour. N. Y. Ent. Soc., vol. XIII, p. 46.

Description. — "Head: notocephalon in the form of an inverted wine-decanter, margins greatly curved, widely diverging toward the vertex, which is six to eight times wider than the synthlipsis, at which point, the eyes are almost contiguous; breadth of the eye about ten times as great as that of the synthlipsis. Pronotum: humeral angles acute, accentuated, lateral margins sinuate, humeral margins little separate from the posterior margin. Metanotum dark purple-brown. Hemelytra varying from dark brick-red to rich orange-yellow; a large irregular black blotch at the base of the corium extending transversely and nonacuminately from the apex of the clavus to the golden-yellow exocorial lateral submargin; membrane dark red-brown, apically black — this tint encroaching more or less basally. Alar nervures brown. Pedes: coxæ blackish; intermediate tibial spur blunt, subcylindrical. Abdominis dorsum: first and second segments rufotestaceous, deeper marginally, the remainder flavotestaceous, lurid marginally; this latter tint encroaching more and more apically. Abdominis venter rufotestaceous, densely provided with greenish black cilia." (Kirk., Rev., p. 415.)

Distribution. — Massachusetts (Uhler, Montandon and British Museum), New Orleans (Paris Museum), Florida (Uhler). My collection: Van Cortlandt Pk., New York (also colls. U. S. N. M., Davis and Heidemann); Putnam Co., N. Y.; Washington, D. C. (also coll. Heidemann); Palisades, N. J. "La.," U. S. N. M.

Notonecta uhleri was first described by Kirkaldy in 1897 (l. c.), from a male in the Uhler collection. It is a very rare bug, but so characteristic that its late description is remarkable. I have found records of only twenty-five specimens of this insect in collections, of which the type and one other are in Prof. Uhler's collection, a cotype in Mr. Kirkaldy's, two specimens in Mr. Otto Heidemann's, three in the U. S. National Museum, two in the British Museum, one in the Paris, another specimen in the collection of Mr. W. T. Davis, and the remaining thirteen in mine.

This waterbug is very noticeable on account of its bright color and peculiar notocephalic structure. It is impossible to mistake it for any other, although it approaches *N. variabilis* somewhat in size and general contour. I have touched on its habits previously, and nothing is known of its life-history or development. I have, however, gotten ova from a female taken in this vicinity, and they are undistinguishable from those of *N. variabilis*.

6. *Notonecta mexicana* Amyot & Serville.*Notonecta mexicana*.

1843. A. & S., Hist. Nat. Ins., Hem., p. 453, pl. 8, fig. 7.
 1853. Herr.-Sch., Wanz. Ins., IX, p. 43, pl. 294, fig. 903.
 1884. Uhl., Stand. N. H., p. 252.
 1886. Uhl., Ch. List, p. 28.
 1894. Uhl., Proc. Cal. Acad. Sci., ser. 2, vol. IV, p. 292.
 1895. Gillette & Baker, Bull. 31, Colo. Agr. Exp. Sta., Tech. Ser. I, p. 63.
 1897. Kirk., Tr. Ent. Soc. Lond., p. 401.
 1901. Champ., Biol. C.-A., Rhynch. II, p. 368, Tab. 22, figs. 6, 6a-d.
 1904. Kirk., Wien. Ent. Zeit., p. 94 and 132.

N. klugii.

1851. Fieb., Abh. Bohm. Ges. Wiss. (5), VII, p. 474.

Description. — "Head narrow at base, parallel for a short space, then sinuately diverging; vertex from three and one half to four and a half times as wide as synthlipsis. Pronotum very transverse, about two and one half times wider than long, lateral margins slightly sinuate, humeral margins gently and elongately curved, posterior margin not sinuate; humeral angles acute, accentuated. Metanotum not quite half as long again as scutellum, black (dark vars.) or violet brown margined with luteous (pale vars.). Hemelytra varying in color, membrane lobes subequal. Alæ semitransparent, smoky, nervures brown (pale vars.), or semitransparent smoky black, nervures blackish-brown (dark vars.). Abdominis dorsum black (dark vars.), or rufoluteous with paler genital segments (pale vars.). Abdominis venter varying from black to testaceous." (Kirk., Rev., p. 401.)

Long., 11 to 14 mm., lat., 4.5 to 4.8 mm.

Distribution. — U. S. National Museum collection: Bright Angel, Hot Springs, and Catalina Mts., Arizona; California. My collection: Pasadena and Sta. Clara, California. "W. States" (49), Fort Collins, Colorado (13).

The shape of the head and the very transverse pronotum separate it very readily from the other species of the genus. In his revision, Kirkaldy goes at length into the color variations, and since his remarks cover the ground exactly, I reproduce them here: "The hemelytra are usually rich scarlet, with black membrane, but the latter hue often extends beyond the apical margins of the clavus and corium; the scarlet also varies much in shade, graduating in one direction to pale greenish-white through pale yellow, pale olive-green, deep yellow, orange, and pinkish, and in the other through crimson and violet-red to deep violet-black, though in the last, the sutures of the hemelytral divisions are usually narrowly violet-red; in some specimens the apex of the corium is black, from the base of the membrane to the margins of the hemelytra in a straight line, and the rest of the hemelytra are rich crimson. The hemelytra are rarely maculate, occasionally the center of the clavocorial suture has a more or less

pronounced black smudge about the center. It may be convenient to propose the varietal names *ceres* for the pale-colored forms and *hades* for the southern violet black race. Herrich-Schäffer (l. c., p. 43) notes a variety with a large central ochreous stripe on the scutellum, while Fieber (l. c., p. 475) describes among the varieties with red hemelytra: (1) "Schild schmutziggelb mit braunem grund," and (2) "Schild braun mit gelblichem rand" — these three varieties I have not seen. In the U. S. National Museum and Heidemann collections the specimens from Colorado Cañon, Hot Springs and Catalina Mts., Arizona, are var. *hades*, and above the average size and with more prominent eyes. In the National Museum there is a specimen from Mexico which has the scutellum with the yellowish base (or apex) mentioned by Fieber (l. c., p. 475).

7. *Notonecta irrorata* Uhler.

Notonecta irrorata.

- 1876. Uhler.
- 1876. Glover, Ms. Notes, p. 54.
- 1878. Uhl., Pr. Bost. Soc. N. H., vol. XIX, p. 443.
- 1883. Packard, Guide, p. 537.
- 1886. Uhl., Ch. List, p. 28.
- 1891. Summers, Bull. Agr. Exp. Sta., U. of Tenn., vol. IV, No. 3, p. 82.
- 1894. Van Duzee, Bull. Buff. Soc. Nat. Sci., vol. V, No. 4, p. 86.
- 1897. Kirk., Tr. Ent. Lond., p. 418.
- 1899. Smith, Ins. N. J., p. 144.
- 1900. Osborn, Contr. Dept. Zoöl. and Ent., O. S. U., No. 2, 8th Ann. Rept. O. St. Acad. Sci., p. 79.
- 1902. Bueno, Journ. N. Y. Ent. Soc., vol. X, pp. 231 and 235.
- 1904. Kirk., Wien. Ent. Zeit., p. 132.
- 1905. Bueno, Journ. N. Y. Ent. Soc., vol. XIII, p. 46.

N. ornata.

? Fitch Ms. (Signoret Coll.).*

Description. — "Head small, notocephalic lateral margins diverging widely, vertex a little more than three times as wide as the synthipsis; width of vertex and of the eye subequal; eyes rather larger proportionally than in *N. triguttata*, etc. Pronotum much wider basally than apically, lateral margins not sinuate, humeral angles acute, humeral and posterior margins sinuate. Hemelytra rich black, irrorated (especially on the clavus) with refulgent yellow brown, anterior lobe of membrane and apex of exterior lobe, smoky. The irrorations vary greatly in different individuals; in some the corium and membrane are almost immaculate, in others the whole of the valvus and corium is irrorated, imparting a checkered appearance, while in others the clavus is rich (almost metallic) yellow-brown with faint distant narrow black lines. Alar nervures brown. Pedes: intermediate tibial spur small. Abdominis dorsum: first to fifth segments black, sixth, seventh and eighth sordid grayish-brown. Abdominis venter black." (Kirk., Rev. p. 418.)

Long., 11.8 mm. to 14.4, lat., 3.6 to 4.7 mm.

Distribution.—My collection: Laval Co. and Montreal, Quebec; Ithaca, Putnam Co., Van Cortlandt, Staten Island and Long Island, N. Y.; Palisades, Rahway R., Westfield, and Delair, N. J.; Baltimore, Md.; Washington, D. C.; Lake Forest, Ills.; Columbus, Ohio (also recorded in 31). U. S. National Museum; Rhode Island; Lake Maxincuche and South Bend, Indiana. Buffalo, N. Y. (53), Tennessee (39), Madison, N. J. (38), and "U. S." (49). Keene Valley, N. Y. (State Museum), Wellington, Ohio, and Bladensburgh, Md. (Coll. Heidemann). Montana (Coll. Van Duzee). Michigan, Kentucky.

The habits of this handsome bug are covered in the first part of these notes. It may not be out of place to call attention to a peculiarity it possesses in common with the other colored forms of the genus. On being removed from the water it has an evanescent bluish tinge on the hemielytra, caused doubtless by the pile that covers them. The same phenomena I have noted in *N. uhleri* and *N. insulata*.

8. *Notonecta lutea* Muller.

Notonecta lutea.

- 1776. O. F. Muller, Zool. Dan., p. 103.*
- 1814. Fall., Hydr. et Nauc. Sweciae, p. 6.
- 1851. Fieb. "Rhynchographien," Abh. Bohm. Ges. Wiss. (5), vol. VII, p. 473. (Separate, p. 49.)
- 1851. Lieb. Gen. Hydroc., p. 26.
- 1860. Flor. Rhynch. Livl., vol. I, p. 774.*
- 1860. Fieb., Eur. Hem. (1), p. 100.
- 1875. J. Sahlbg., Not. Sallsk. Faun. Fenn. Forh., vol. XIV, p. 274.
- 1880. Puton, Hem. Fr., pt. 4, p. 218.
- 1891. Duda, Klub. prirod. Praze, p. 13, pl. IV, fig. 1.*
- 1897. Kirk., Tr. Ent. Soc. Lond., p. 425.
- 1904. Bueno, Ent. News, vol. XV, p. 220.
- 1904. Kirk., Wien. Ent. Zeit., p. 132.

N. unicolor.

- 1835. Herr.-Sch., Nomencl. Ent., p. 63.*
- 1848. Herr.-Sch., Wanz. Ins., vol. VIII, p. 23.*

Description.—"Head large, notocephalic lateral margins slightly diverging from the base, vertex two to two and a quarter times as wide as synthipsis. Entirely luteous (except the dark claret eyes, occasional dark-brown markings along the sutures of the clavus, etc., the bronze-brown sternal hair-tufts, the black unguiculi and venter). Scutellum a third wider than long. Exterior lobe of membrane about half the size of the interior lobe and obviously not so long. Alar nervures luteous. Pedes: spine on intermediate tibia large, acute, black-tipped." (Kirk., Rev., p. 425.)

Long., 13 to 17.1 mm., lat., 4.5 to 5.5 mm.

Distribution.—In Europe, Lapland, Finland, Sweden, Bohemia, Austria; in Asia, Siberia. North America, Bearfoot Mts., B. C. These localities are all taken from the various works cited, except the American, which is from specimens in my collection.

The presence of *Notonecta lutea* in the northwestern extremity of this continent is one of the curious facts in faunistics that are used as arguments to bolster up theories. I express no opinion on it, beyond calling attention to the fact that no theory of importation by man can account for its presence here, since it is not one of the parasitic Hemiptera, and the only seemingly reasonable explanation is a migration by some obscure means.

g. *Notonecta shooterii* Uhler.

Notonecta shooterii.

1894. Uhl., Proc. Cal. Acad. Sci., 2d ser., vol. IV, p. 292.

1897. Kirk., Tr. Ent. Soc. Lond., p. 406.

1901. Champ., Biol. C.-A. Rhynch., vol. II, p. 368.

1904. Kirk., Wien. Ent. Zeit., pp. 94 and 132.

Description. — "Head short, notocephalic lateral margins slightly diverging from the base and slightly converging towards the vertex, which is about one third larger than the synthlipsis. Pronotum large, rather longer in proportion to its width than in the other species, lateral and humeral margins sinuate. Scutellum small, nearly one third shorter than the metanotum; black, base purple-brown. Sterna sordid rufo-testaceous, hair-tufts black. Hemelytra black; clavus (apex excepted) dull ivory-white, corium more or less concolorous, forming with the clavus a blotch of varying extent, and usually with a whitish spot along the apical margin, the claval and corial markings very similarly disposed to those of *N. triguttata*; apex of membrane, smoky. The hemelytra, vary, however, very much, being quite violet black in some individuals (*melana*, var. nov.), while in others they are concolorous pale luteous. Membrane lobes always subequal in ordinary forms; generally unequal in the leucochroic varieties (*ochrothoe*, var. nov.), and rarely subequal (*tearca*, var. nov.). Alar nervures rich brown. Pedes: intermediate coxæ black, tibial spur small, rather blunt. Abdominis dorsum: segment 1 black, 2-5 violet-brown (the fifth apically black), 6 blackish, genital segments greenish-testaceous, all the segments more or less dull blackish laterally. Venter varying from green to black, carina and cilia black." (Kirk., Rev., pp. 407-8.)

Long., 8 to 13 mm., lat. pron., 4 to 4.7 mm.

Distribution. — San Diego, Cal., (51); Los Angeles, (U. S. N. M.), San Francisco (coll. Am. Mus. N. H. and mine), and Palo Alto, California. "California" (23).

Kirkaldy (l. c., p. 407), says: "Prof. Uhler informs me that in the U. S. National Museum there is a specimen of this species pure ivory-white. . ." I have had the good fortune to examine this and another similar specimen very closely. While in the absence of a long series and in deference to Prof. Uhler's determination they may for the time being be allowed to remain in this species, nevertheless they differ from the typical *shooterii* in being far more convex, the head apparently more flattened anteriorly, and in having a more

cylindrical pronotum. In typical examples the humeral angle is very distinct, but it is very much rounded and nearly obsolete in the leucochroic ones, both of which are from Mexico. The types of the bug are from California.

10. *Notonecta montezuma* Kirkaldy.

Notonecta montezuma.

1897. Kirk., Tr. Ent. Soc. Lond., p. 402.

1901. Champ. Bio. C.-A., p. 396, tab. 22, figs. 8, 8a ♂, 9 ♀.

1904. Kirk., Wien. Ent. Zeit., pp. 94 and 132.

Description. — Head narrow at base, similar to that of *N. mexicana*, notoccephalic lateral margins fairly straight, diverging from the base, vertex two and a half to three times as wide as synthlipsis. Hemelytra orange-red, suffused (especially marginally) with crimson, and sparingly and irregularly marked with black; membrane bluish-black, apex brownish-black, lobes subequal. Pedes: coxæ brownish-black, intermediate tibial spur, small, rather blunt. Abdominis dorsum: segment 1 black, 2 sordid testaceous, suffused with crimson and margined with black. Venter black." (Kirk., Rev., pp. 402-3.)

Long., 13.1 to 14 mm., lat., 4.7 to 5 mm.

Distribution. — Havilah, California. (Am. Mus. N. H. coll.)

It is interesting to record this bug from the United States, and the American Museum of Natural History is to be congratulated in the possession of this unique specimen among the other rare things in the Henry Edwards Collection. The type is a specimen from Mexico in the Hope Museum, Oxford. There is another specimen in the Paris Museum. I am aware of no other records. This addition to our fauna makes this article practical for the separation of all the known American species of the genus *Notonecta*, except the South American *N. bifasciata* Guérin and *N. nigra*, described by Fieber from Brazil, the latter being represented by only three specimens in collections.

11. *Notonecta insulata* Kirby.

Notonecta insulata.

1837. W. Kirby, in Richardson's Faun. Bor. Am., Ins., p. 285. (Reprint 1878, Can. Ent., vol. X, p. 216).*

1851. Fieb., Rhyctographieen, Abh. k. u. k. böhm. Ges. Wiss. (5), VII, p. 475.

1875. Uhl., Rept. U. S. G. & G. Surv., vol. V, p. 841.

1876. Glover, Ms. Notes, p. 54 and pl. V, fig. 4.

1877. Uhl., Bull. U. S. G. & G. Surv., vol. III, no. 2, p. 453.

1878. Uhl., Bull. U. S. G. & G. Surv., vol. IV, p. 509.

1878. Uhl., Proc. Bost. Soc. N. H., vol. XIX, p. 442.

1886. Uhl., Ch. List, p. 28.

1894. Van Duzee, Bull. Buff. Soc. Nat. Sci., vol. V, no. IV, p. 186.

1895. Gillette & Baker, Bull. 31, Tech. Ser. I, Agr. Exp. Sta., Ft. Collins, Colo., p. 63.

1897. Kirk., Tr. Ent. Soc. Lond., p. 403.

1899. Smith, Ins. N. J., p. 144.

1902. Bueno, Jour. N. Y. Ent. Soc., vol. X, p. 231-2.

1904. Kirk., Wien. Ent. Zeit., pp. 94 and 132.

1904. Uhl., Proc. U. S. N. M., vol. XXVII, p. 364.

1905. Bueno, Jour. N. Y. Ent. Soc., vol. XIII, p. 46.

N. impressa.

1851. Fieb., Abh. Bohm. Ges. Wiss., (5), vol. VII, p. 475.

1886. Uhl., Ch. List, p. 28.

N. rugosa.

1851. Fieb., l. c., p. 476.

N. fabricii.

1891. Towns., Proc. Ent. Soc. Wash., vol. II, p. 56 (nec. Fieb.).*

Description. — "Head; notocephalic lateral margins fairly straight and nearly parallel, very slightly constricted near the base; vertex little wider than synthipsis, which is about one fourth less than the width of the base of the eye. Lateral and humeral margins of the pronotum sinuate. Scutellum varying slightly in length, but occasionally reaching and usually nearly reaching the base of the metanotum, black (Fieber in *N. rugosa* records two varieties (*cordigera* and *basalis*) with yellowish scutellum, but I have not seen them). Hemelytra variable in pattern and color * * * Ate, basal nervures crimson, the others yellow-brown. Pedes: coxae black, intermediate tibial spur small, slender, not tipped with black. Abdominis dorsum: segment 1 black, 2-6 brilliant scarlet, 7-8 reddish-testaceous. Abdominis venter black, connexivum and central carina green." (Kirk., Rev., pp. 403-4.)

Long., 12.6 to 15.5 mm., lat., 4.8 to 5.6 mm.

Distribution. — My collection: Montreal, Quebec; Bearfoot Mts., B. C.; Dillsey, Oregon; Woods Holl, Mass.; Albany, Long Island, New York City and Staten Island, New York; Delair and Palisades, N. J.; San Luis Obispo, Claremont, Mt. Diablo, Santa Clara Co. and Pasadena, California; Humboldt Lake, Nevada (also in coll. Van Duzee); Ft. Collins, Colorado (also Van Duzee coll.); U. S. National Museum Collection: Hartford, Conn.; Indiana; Nebraska; Flagstaff, Arizona; Colorado; Las Vegas, New Mexico; Warner Lake, Oregon; Salt Lake, Utah; Palm Springs, Placer County, Santa Barbara and San Diego, California. Collection Heidemann: Palo Alto, California; Lakeside, S. D. Collection Ohio State University: Maine; Pine Ridge, Nebraska; Peach Springs, Arizona. Black Hills, Dakota (Am. Mus. N. H.); Orono, Maine, and Andover, Mass. (Hatch Exp. Sta.); Da Costa, N. J. (38); Buffalo, N. Y. (53); Denver, Colorado (13); Owens Valley, California (43); Milk River region, Montana (44); Las Vegas Hot Springs, New Mexico (52). I have also seen specimens from Mt. Katahdin, Maine.

Kirkaldy recognizes five color varieties (omitted in the preceding copy of his description), but while such terms may at times be convenient, it is as difficult in this species, as it is in *N. undulata* to draw a fixed line of demarkation to separate them. It ranges through vari-

ous degrees of fuscous, greenish-white and testaceous, all more or less marked with black, which color, however, is sometimes absent. Prof. Uhler at one time was of the opinion that the European *N. glauca* L. was to be found in America, basing it on the light-colored unicolorous individuals that are at times to be found in the Eastern United States. Individuals from mountainous regions are in general somewhat stouter in form, with flattened heads and more strongly arched pronotum.

I wish here to express my gratitude to the gentlemen who have in many ways most kindly helped me in this work: To Dr. L. O. Howard for the privilege of working over the U. S. National Museum material; to Mr. George W. Kirkaldy for much encouragement and valuable assistance in many ways; to Professor Herbert Osborn, Mr. Otto Heidemann, Mr. E. P. Van Duzee, Prof. H. T. Fernald, and many other gentlemen for gifts and loans of specimens.

In conclusion, I may say that the deficiencies of this article are very evident to me. It had been planned on more extensive and minute lines, but the unfortunate difficulty in obtaining material from our Southern and Western States has put such work out of the question for the time being. Therefore, I determined to present to observers such of my partial results as were in a more advanced stage, in order to arouse interest and make possible the completion at some later date of a genuine monograph of the entire family for the region I treat of here. For the same reason, I have reproduced in extenso Mr. Kirkaldy's descriptions, as they are so excellent that with them the work of identification of the species is much simplified; and also, I wished to make them accessible to American workers. I trust that my work will be of help to all who avail themselves of it.

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EXPLANATION OF PLATE VII.

- Fig. 1. *Notonecta indica* Linné.
 - Fig. 2. *Notonecta undulata* Say.
 - Fig. 3. *Notonecta variabilis* Fieber.
 - Fig. 4. *Notonecta uhleri* Kirkaldy. (Drawn from cotype.)
 - Fig. 5. *Notonecta mexicana* Amyot & Serville var. *ceres* Kirkaldy. (Drawn from cotype.)
 - Fig. 6. *Notonecta irrorata* Uhler.
 - Fig. 7. *Notonecta lutea* Müller.
 - Fig. 8. *Notonecta shooterii* Uhler.
 - Fig. 9. *Notonecta insulata* Kirby.
- All enlarged three diameters.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF NOVEMBER 15, 1904 (continued from page 102).

Mr. Davis read a letter from Mrs. Annie Trumbull Slosson, in which she stated that she had taken in pools of brackish water in southern Florida, an undetermined *Limnobates*, a specimen of which she sent for comparison with *Limnobates lineata* spoken of by Mr. Bueno. She also referred to her finding of *Halobates wullersterfi* on the beach at Lake Worth, Fla. She published a record of this in 1901 and no other record is known of their occurring on land, their usual habitat being far out at sea. She also sent specimens of *Brenthus anchorago* to show the great variations in size, remarking that she had taken it in numbers in its breeding places under the bark of gumbo-limbo (*Bursera gunnifera*) but had also found it frequently on

flowers in the sunshine. She referred to the capture of *Cylas formicarius* whose food plant she was the first to discover several years ago. It breeds in the stems of an odd "morning glory" (*Ipomœa pes-capræ*) which trails along the beaches of Southern Florida. She expressed her regrets at not being able to attend the meetings of the society.

MEETING OF DECEMBER 6, 1904.

Held at the American Museum of Natural History. President C. H. Roberts in the chair with nine members present.

On motion of Mr. Groth the society voted to dispense with the regular order of business and proceed to the discussion of new business. Mr. Groth gave notice that he would like to have brought before the society at its next meeting a former tabled motion of his, that the Journal be furnished free of cost to active members in good standing.

Mr. Schaeffer exhibited a box of the rarer Cleridæ and made some remarks on the species.

Mr. Leng and Mr. Davis also exhibited their collections of Cleridæ.

Mr. Joutel exhibited his collection of *Saperda* representing nearly all of the known species of the United States, Europe and Asia. He gave an account of the manner of working of most of the species and exhibited specimens of wood showing their characteristic borings.

An exhibition of *Cicind. la longilabris* Say and its varieties was made by Mr. Harris, accompanied with remarks concerning the distribution of the species and the relation of the variety to the type. Special attention was called to a very full series of the form taken at Kaslo and its vicinity in British Columbia by Mr. Cockle. *Longilabris* proper was represented in part by long series from Mt. Desert on the Maine Coast, Cape Breton, Province of Quebec and the Adirondack region of New York State.

Mr. Davis stated that a friend had recently sent him a specimen of *C. longilabris* from Long Lake, in the Adirondack Mts., some forty miles west of where Mr. Harris took his specimens last summer on Jay Mt.

Mr. Bueno showed a specimen of *Nerthra stygia* Say, from Mrs. Slosson's collection. He stated briefly that Prof. A. L. Montandon, of Bucarest, failed to recognize this species in his revision of the subfamily Mononychinae, stating that this insect has not been recognized since Say's original description, the date of which is uncertain, but according to Prof. Uhler was in March, 1832. Prof. Montandon further states that in view of Say's description it is evident that the insect does not belong to the genus *Mononyx*, but more likely to *Peltopterus* Guérin. Mr. Bueno called attention to the fact that *Nerthra stygia* certainly does not belong to the genus *Mononyx* as now restricted, approaching more closely to *Peltopterus*. In his opinion Say was right in erecting a new genus for its reception, of which the characters are: absence of membrane in the hemielytra, which are entirely coriaceous and soldered together by a straight suture. He showed for comparison specimens of *Mononyx nepæformis* and *M. fuscipes*, from which the roughened upper surface of *Nerthra* is sufficient to separate it. He also showed a *Mononyx* from Biscayne Bay, Florida, belonging to Mr. Otto Heidemann, which would seem to be a new species.

JOURNAL
OF THE
New York Entomological Society.

Vol. XIII.

DECEMBER, 1905.

No. 4

Class I, HEXAPODA.

Order II, COLEOPTERA.

ON THE AFFINITIES OF THE GENUS *TACHYCELLUS*,
WITH DESCRIPTIONS OF NEW
SPECIES FROM THE WESTERN
UNITED STATES.

BY H. C. FALL,

PASADENA, CAL.

The first reference to the genus *Tachycellus* in our literature was made by LeConte in his "Notes on the Species of *Agonoderus*, *Bradycellus* and *Stenolophus* Inhabiting America North of Mexico." * In this paper, which was prompted by one on North American Carabidæ by Chaudoir, † LeConte declares himself not ready to follow the French author in referring certain of our species to *Tachycellus* Moraw., which species he retains as Group A of *Bradycellus*, as follows :

dichrous Dej.
vulpeculus Say.
autumnalis Say.

badiipennis Hald.
atrimedius Say.
nebulosus Lec.
nigrinus Dej.
tibialis Kirby.

In his Genera of Carabidæ (1881), Dr. Horn admits the validity of *Tachycellus* for the species of the second column above, and transfers those of the first column to *Harpalus*. Two years later Horn gives in the Brooklyn Bulletin ‡ a synoptic table of *Tachycellus*, in

*Proc. Acad. Nat. Sci. Phila., 1868, p. 373.

† Revue et Mag. de Zoologie, 1868.

‡ Bull. Brook. Ent. Soc., VI, 1883, p. 51.

which the species stand precisely as now recorded in the Henshaw list, viz.:

nigrinus Dej.

kirbyi Horn.

atrimedius Say.

nebulosus Hald.

badiipennis Hald.

nitidus Lec.

In this treatment of the genus, *tibialis* is made a synonym of *nigrinus*, *nitidus* (withdrawn from LeConte's Group B of *Bradycellus*) is admitted, and *kirbyi* is new, the brief tabular characters serving for its description.

The sole criterion offered by the "Classification" for the distinction of *Tachycellus* from *Bradycellus* lies in the number of glabrous joints of the antennæ, these being three in the former, and two only in the latter genus. This character is assumed to be constant, but investigation shows that it is not strictly true of *nigrinus*, in which the third joint is clothed somewhat sparsely in its apical half with the same kind of pubescence as the following joints. The same condition exists in a second species—*turbatus*—to be described in the present paper. Another character of importance, mentioned by LeConte and Horn, is the presence of squamules on the lower surface of the middle tarsi in *Tachycellus* (except *nitidus*), and the absence of such squamules in *Bradycellus* (except *linearis*). The two exceptions named were each made the type of a distinct genus (*Glycerius* and *Amerinus*) by Casey in 1884, both of which were shortly after repudiated by Horn. The characters used by Casey seem, it is true, of somewhat trifling moment, but the elimination of these two aberrant forms at least possessed the merit of leaving *Bradycellus* and *Tachycellus* more homogeneous, and separable by one constant character. I have not seen Morawitz's description of *Tachycellus*, but from the remarks of subsequent authors it seems clear that he based the genus chiefly upon the tarsal character above named, and laid little if any stress upon the number of glabrous joints of the antennæ, which for aught I know he may not have mentioned at all. At all events they are not alluded to by Seidlitz in his Fauna Transylvanica, nor does Ganglbauer use the character in his more recent masterly treatment of the Käfer von Mitteleuropa. The latest European Catalogue—that of Heyden, Reitter and Weise—follows Seidlitz, who characterizes the genus thus:

Tarsi above and eyes hairy; mentum toothed, scutellar stria rarely present; prosternum not margined in front, hind tarsi not grooved; male with a more densely punctured and pubescent spot on the abdomen, just back of the hind coxæ, and with the front tarsi furnished beneath with two rows of squamules.

As thus constituted the genus includes *cognatus* Gyll — placed as a *Bradycellus* in our lists — and several allied forms, all of which Ganglbauer has properly transferred to *Dichirotrichus* Duval on the basis of the presence of a seta in the hind angle of the prothorax, creating for them the subgenus *Trichocellus*, typical *Dichirotrichus* having the male front tarsi pilose rather than squamulose beneath, and the upper surface of the body conspicuously pubescent and rather closely punctured throughout. The latter author regards *Tachycellus* as merely a subgenus of *Bradycellus*, separable by its squamose middle male tarsi, these being simple in the true *Bradycellus*; a single small species (*similis* Dej.) is referred to it.

What now is the bearing of this upon the disposition of our own species? The interpretation of Seidlitz is totally different from that of either Le Conte or Horn, and would exclude all the species we now refer to the genus, substituting for them *cognatus* alone. The view of Ganglbauer is more nearly in accord with that of our own authors, and if we reverse in order of importance the antennal and tarsal characters, the desirability of which is indicated above from a study of our own species, the two become practically identical. The question as to whether the differences in the modification of the male tarsi are to be regarded as of generic or subgeneric import is of course a matter of opinion; Ganglbauer holds the latter view; I am inclined to the former. Such characters are commonly held to be of rather more than ordinary importance, and are almost invariably associated with others which, if somewhat trivial in themselves, assume an added importance in conjunction with the former; moreover, in the present case, clearness of exposition is certainly facilitated thereby.

Let us pass briefly in review the species of *Tachycellus* as they now stand in the Henshaw list. It is first necessary to remove *nebulosus*. An examination of the LeConte type during a recent visit to Cambridge shows it to be a typical *Bradycellus*, closely resembling and probably not distinct from *rupestris*. *Nitidus* is a very aberrant form and cannot be retained in the genus, the only reason for so associating it being the nearly glabrous third joint of the antennæ. It is more nearly related to *Bradycellus*, but does not properly enter there and the proper course would seem to be to restore Casey's genus *Glycerius* for this and several allied forms to be herein described.

The remaining species agree in possessing the fundamental tarsal characters of the genus, and all, with the exception of *nigrinus*, have

the finer pubescence of the antennæ beginning on the fourth joint. *Badiipennis*, in its rounded posterior thoracic angles, departs somewhat in facies from the other three. Regarding these four species together with two undescribed forms in my collection as exponents of the genus, the latter may be characterized as follows :

Genus TACHYCELLUS Morawitz.

Penultimate joint of labial palpi not longer than the terminal joint and bisetose in front; front and middle tarsi of males with two rows of squamules beneath, the former moderately, the latter (except rarely) feebly or scarcely dilated, the fourth joint emarginate; mentum toothed; finer pubescence of the antennæ commonly beginning on the fourth joint, more rarely at the middle of the third; body throughout glabrous; side margin of prothorax with a single seta before the middle; elytra normally striate and with a single dorsal puncture; prosternum non-setose at tip; abdomen without pubescent spot in the male.

TABLE OF SPECIES.

Antennæ with three glabrous joints.

Hind angles of thorax sharply defined and nearly rectangular.

Legs pale.

Prothorax testaceous, with large piceous spot; width at base not greater than the length.....*atrimedius*.

Prothorax piceous, marginal bead alone paler; width at base a little greater than its length.....*kirbyi*.

Legs piceous, the tibiæ paler at base.....*conformis*.

Hind angles of thorax obtuse, rounded.....*badiipennis*.

Antennæ with two glabrous joints, the third pubescent in outer half, though less conspicuously so than the following joints.

Hind angles of thorax rectangular, middle tarsi scarcely dilated in the ♂

nigrinus.

Hind angles of thorax obtuse, scarcely rounded; middle tarsi of male nearly as widely dilated as the front tarsi.....*turbatus*.

T. atrimедius Say, Trans. Am. Philos. Soc., II (1823), p. 39.

"Length 7 mm. Black; prothorax and elytra testaceous, the former with a large quadrate black spot, the latter with a dusky cloud divided by the suture; body slender; prothorax distinctly narrowed behind; hind angles subrectangular, slightly prominent, not rounded; basal impressions broad, punctured; antennæ with joints 1-3 testaceous, legs testaceous." (LeConte's description.)

Occurs from New England and Canada to Texas. Always easily recognizable by its coloration.

T. kirbyi Horn, Bull. Brook. Ent. Soc. VI (1883), p. 51.

Length 6 mm. Blackish, the elytra gradually becoming castaneous or piceo-castaneous toward the base and sides; epipleuræ, marginal bead of thorax, legs, and basal three joints of antennæ paler. Prothorax moderately narrowed behind, the

length rather less than the width at base; basal impressions broad and moderately deep, thickly punctured.

"Canada and Ohio."

At once distinguishable by its stouter form and darker color from the more common *atrimedius*, the only other species with sharply defined posterior thoracic angles occurring in the same region.

T. conformis, new species.

Length 6.5 mm. Black, shining, basal joint of antennæ pale; legs piceous, the tibiæ, especially at base, somewhat paler. Prothorax distinctly narrowed behind, slightly wider at base than long at the middle; hind angles nearly right; basal impressions broad, very finely and quite sparsely punctate; elytra finely striate.

Washington and California.

Described from a single female specimen from Washington (State), sent me years ago as *nigrinus*. As compared with *nigrinus* it is larger, the thorax more narrowed behind, basal impressions widely punctate (nearly or quite impunctate in *nigrinus*), third joint of antennæ glabrous, elytra more finely striate.

The latter locality — California — is represented by several examples taken by Dr. Fenyès at Pt. Reyes. There is also an example in the LeConte collection, the specimen being placed with *nigrinus*.

T. badiipennis Hald., Proc. Acad. Nat. Sci. Phila., I (1883), p. 302.

"Length 5-6 mm. Blackish; bead of prothorax pale; elytra piceous or dark testaceous; body more slender; prothorax distinctly narrowed behind; hind angles obtuse, rounded; basal impressions well marked, sparsely punctured; legs ferruginous, thighs and tips of tibiæ sometimes darker; first joint of antennæ pale." (LeConte's description.)

This species ranges from New England and Canada to Virginia and Kansas.

T. nigrinus Dej., Spec. IV (1829), p. 39.

"Length 5.5-6.5 mm. Black, shining, not iridescent; prothorax with hind angles rectangular; basal impressions linear, strongly marked, smooth, or scarcely punctured; anterior transverse impressions distinct, strongly angulated; upper part of tibiæ and first joint of antennæ testaceous." (LeConte's description.)

Alaska, Lake Superior, New Mexico (Beulah), Northern California (McLond, Fenyès).

The prothorax is less narrowed posteriorly than in any of our other species.

T. turbatus, new species.

Robust, feebly convex, piceous black with very faint greenish surface lustre, marginal bead of prothorax, legs, and antennæ pale. Antennæ a little less than half

the length of the body, rather more slender than in *badiipennis*; pubescence beginning at the middle of the third joint. Prothorax moderately transverse, widest before the middle; sides arcuately converging to base which is slightly wider than the apex; base angles obtuse, scarcely rounded; median line fine and complete; basal impressions broad with about eight minute punctures at the bottom of each impression. Surface otherwise impunctate. Elytra two fifths wider than the prothorax and seven tenths as wide as long; striæ fine, impunctate, intervals flat; apex rather strongly sinuate. Front and middle tarsi broadly dilated in the male, the fourth joint emarginate. Length 5.5 mm., width 2.5 mm.

New Mexico.

Described from two examples (♂♀) collected at Beulah (8,000 ft.), and Cloudcroft (9,000 ft.) by Cockerell and Knaus respectively.

As the genera are at present defined this species will prove a disturbing element wherever placed. The third joint of the antennæ being pubescent in apical half would, strictly speaking, exclude it from *Tachycellus*, but the same is true of *nigrinus* which has long occupied a place in the genus. The middle tarsi are nearly as widely dilated as the front ones in the male of *turbatus*, but much less so in typical *Tachycellus*. *Turbatus* cannot, however, be included in *Stenolophus* because of the toothed mentum and non-bilobed fourth tarsal joint, nor can it be referred to *Bradycellus* because of the squamose intermediate male tarsi. Of the species now referred to *Tachycellus*, *turbatus* most resembles *badiipennis*, though distinctly more robust.

Genus GLYCERIUS Casey.

This genus was established by Casey for the *Acupalpus nitidus* of Dejean, subsequently referred to *Bradycellus* by Mannerheim and LeConte, and to *Tachycellus* by Horn. The species represent a well marked type, differing conspicuously in facies and in combination of structural details from any of the genera with which it has been associated, and notwithstanding its rejection by Horn, the genus appears to me to be well founded. In Casey's short diagnosis much stress is laid upon the numerous marginal setæ of the prothorax. The character is indeed a remarkable one but it possesses absolutely no weight from a generic standpoint, there being only the normal single seta each side in each of the new species described below, all of which are certainly congeneric with *nitidus*. Briefly the principal characters of the genus are as follows:

Mentum toothed; front tarsi (♂) rather feebly dilated and biserially squamulose, middle tarsi undilated and without squamules; antennæ with three glabrous

joints; scutellum short and broad, only feebly entering the elytral disk; upper surface glabrous, polished; elytra with the sutural stria alone impressed, the others feeble or completely effaced; dorsal punctures wanting; lower surface sparsely punctured and pubescent, tip of prosternum plurisetose, abdomen in the male with two small densely punctured and pubescent spots (sometimes confluent) on the second and third segments.

TABLE OF SPECIES.

Prothorax at sides plurisetose; size large (5-7 mm.) color usually entirely or in great part testaceous.....**nitidus**.

Prothorax at sides unisetose, color piceous, usually more or less bronzed, rarely obscurely suffused with testaceous.

Hind angles of prothorax rectangular or very nearly so, abdominal pubescent spots in the ♂ well separated; size smaller (3.5-5 mm.).....**politus**.

Hind angles of prothorax obtuse, the prothorax more distinctly narrowed posteriorly; abdominal pubescent spots in the male confluent; size small.

Sides of prothorax slightly sinuate before the hind angles, the latter more sharply defined; elytra three times as long as the prothorax.

intermedius.

Sides of prothorax scarcely visibly sinuate before the angles, which are less sharply defined; elytra two and one half times as long as the prothorax.

obtusus.

G. nitidus Dej.

This is our largest species and may always be recognized by the numerous marginal setæ of the prothorax. These setæ are about seven in number and more closely placed in front; there is no seta in the hind angle. The color in California specimens is commonly entirely testaceous, but specimens are frequently seen having two elongate discal spots on the thorax, and a discal stripe on the elytra black. The black color is inclined to spread by diffusion, but I have never seen specimens from our territory with either thorax or elytra entirely dark. In a series of Mexican specimens before me the elytra are entirely black in some specimens while in others the entire upper surface is thus suffused. These are the *obsoletus* of Say. As observed by Bates in the *Biologia*, the form in the Mexican specimens seems a little more elongate than in those from California, but the difference is elusive and it is probable that Horn was correct in declaring them identical. The elytral striæ except the sutural, which is always sharply impressed, are very variable. Commonly there are faint traces of one or more discal striæ and occasionally these are all discernible; in many specimens however they are completely effaced. The pubescent spots of the second and third segments are very small and separated by a distance rather greater than their own diameter.

The species ranges from British Columbia to Lower California and far into Mexico.

G. politus, new species.

Similar in form to *nitidus* but smaller. Body entirely black, highly polished above, usually with distinct greenish tinge; rarely obscurely suffused with testaceous, especially toward the base of the elytra; legs and base of antennæ testaceous. Prothorax rather feebly narrowed posteriorly, the sides sinuate before the hind angles which are nearly right. Sides with a single marginal seta just before the apical third; basal impressions rather broad and with a few punctures. Elytral striæ except the sutural, faint or obliterated. Lower surface except the prosternal side pieces sparsely punctate, each puncture bearing a short hair; ventral surface finely but distinctly alutaceous, shining; pubescent spots in the male distinctly separated. Length 3.5 to 5 mm.

Oregon (The Dalles) to southern California. A rather common species which has hitherto been unaccountably confused with *nitidus*. It is evidently this species which Dr. Hamilton referred to as "the small form" in his Random Notes on Coleoptera (Ent. News, 1896, p. 291) where he says of *Tachycellus nitidus*, "Scarcely a species in the whole range of Coleoptera exhibits greater diversity among the individuals in size and color, varying from .14 to .28 inch in length and from bronzed black to testaceous. According to Dr. Horn the small form which is the black one is usually the male, while the larger testaceous individuals are mostly females." It is needless to say that the statement quoted is entirely misleading.

G. intermedius, new species.

Black, highly polished, with distinct bronze or green bronze surface lustre; base of antennæ and legs pale. Prothorax more distinctly narrowed behind than in *politus*, sides slightly sinuate before the hind angles, which are plainly obtuse though sharply defined; basal impressions with very few fine punctures. Otherwise nearly as in *politus*. Length 4.2-4.5 mm.

California. Described from three females, two of which (the types) were taken by me in the San Bernardino Mts., the third by Dr. Fenyes at Lake Tahoe. It is assumed in the table that the abdominal pubescent spots are as in *obtusus*.

G. obtusus, new species.

Differs from *intermedius* in its more obtuse hind angles of the prothorax, the side margins not or scarcely sinuate before them; also in the relatively shorter elytra, as indicated in the table. The abdominal pubescent spots in the male are contiguous. Length 3.5-4 mm.

Southern California (Pasadena, Azusa, Claremont). Our smallest species. Thus far it has been taken only in the valleys at elevations

of 1,000 feet more or less, while *intermedius* has occurred only at elevations of 5,000 to 7,000 feet in the Sierras.

The Harpaline genera of our fauna allied to *Tachycellus*, viz., those which have the terminal joint of the labial palpus equal to or longer than the preceding, and the penultimate joint bisetose in front, may be tabulated as below. The claims of *Trichocellus*, *Glycerius* and *Amerinus* to rank as distinct genera cannot be finally settled until a thorough study of the Harpali of both the Nearctic and Palearctic regions has been made. For the present their use will facilitate a clearer expression of the mutual relations of our own species and this in itself is a sufficient reason for their acceptance pending the broader study.

TABLE OF GENERA.

Penultimate joint of anterior and middle tarsi of male bilobed, the middle tarsi dilated; prosternum plurisetose at tip; mentum not toothed..... *Stenolophus*.

Penultimate joint of anterior and middle tarsi simply emarginate, middle tarsi not or feebly dilated in the male (except *Tachycellus turbatus*).

Middle tarsi of ♂ biserially squamulose..... *Tachycellus*.

Middle tarsi of ♂ without, or with but few (*Amerinus*) squamules beneath.

Body beneath sparsely punctured and pubescent, prosternum plurisetose at tip, antennæ with three glabrous joints, males with pubescent spot or spots at base of abdomen.

Upper surface completely glabrous, sutural stria of the elytra alone impressed, the others feebly indicated or completely effaced; dorsal punctures wanting; thorax without seta in posterior angle.

Glycerius.

Upper surface with sparse fine pubescence; elytra normally striate with the usual single dorsal puncture, hind angles with setigerous puncture..... *Trichocellus*.

Body beneath glabrous and impunctate (except the prothorax in *Amerinus*), prosternum bisetose or non-setose at tip; antennæ with two glabrous joints, males without pubescent spot at base of abdomen.

Mentum toothed, elytra with a single dorsal puncture, prosternum non-setose at tip.

Middle tarsi of ♂ without trace of squamules beneath, tooth of mentum much shorter than the lateral lobes, elytra feebly sinuate at tip *Bradycellus*.

Middle tarsi of ♂ with a few squamules beneath, tooth of mentum as long as the lateral lobes, elytra strongly sinuato-truncate at apex. *Amerinus*.

Mentum not toothed, elytra frequently with several dorsal punctures, posternum either bisetose or non-setose at tip..... *Acupalpus*.

The number of setæ at the tip of the prosternum is a somewhat useful character, being constant throughout each genus except *Acu-*

palpus, and entirely independent of sex ; there is also, as in numerous other Carabide genera, some variation in the number of anal setigerous punctures. These variations are indicated categorically below :

Stenolophus. — Prosternum plurisetose at tip ; anal setæ variable. In the majority of species there are two each side in both sexes but in several species there is but one each side in the male.

Tachycellus. — Prosternum plurisetose at tip ; anal setæ one each side in the male and two in the female, except *turbatus*, in which there are two each side in both sexes.

Glycerius. — Prosternum plurisetose at tip ; anal setæ two each side in both sexes of *nitidus*, but in all the other species there is one each side in the male and two in the female.

Trichocellus. — Prosternum plurisetose ; anal setæ one each side in the male and two in the female. Our only representative is the common *cognatus*, widely dispersed over the northern part of both continents ; there are several allied species in Europe.

Bradycellus. — Prosternum without setæ ; anal setæ two each side in both sexes.

Amerinus. — Prosternal and anal setæ as in *Bradycellus* except that the interior anal setæ are not marginal.

Our only species is *Bradycellus linearis* of LeConte. The species is a very peculiar one and besides the tabular characters differs from all our species of *Bradycellus* in its relatively small eyes and long mandibles, sculpture, wider marginal bead of prothorax, the upper surface of which is deeply sculptured and the lower surface sparsely rather coarsely punctate.

Acupalpus. — Prosternum bisetose at tip in those species with several dorsal punctures on the elytra ; non-setose in those with a single dorsal puncture. Anal setæ one each side in the male and two in the female.

THREE NEW SPECIES OF THE GENUS STATIRA LATREILLE.

BY CHARLES SCHAEFFER,

BROOKLYN, N. Y.

Since Dr. Horn's synopsis of the family *Lagriidae** a few additional species of the genus *Statira* have been taken in Arizona and Texas. One of them, *Statira robusta*, I have seen in collections as *opacicollis*, and *simulans* may easily be taken for *pluripunctata*; therefore I thought it advisable to publish the descriptions of these species together with Dr. Horn's synoptic table, which I was obliged to change a little to intercalate the new species.

Genus *STATIRA* Latreille.

TABLE OF SPECIES.

1. Tibiæ sulcate on the outer edge.....	2
Tibiæ rounded on the outer edge, not sulcate	4
2. Setigerous punctures of alternate elytral intervals numerous, tibiæ sulcate nearly their entire length.....	3
Setigerous punctures few, mostly on the third interval, tibiæ sulcate below apical half only.....	<i>subnitida</i> .
3. Elytra subopaque, elytral striæ deeply impressed, punctures of striæ as large as the punctures of the intervals.....	<i>pluripunctata</i> .
Elytra shining, striæ moderately impressed, punctures of striæ smaller than those of intervals.....	<i>simulans</i> .
4. Elytra unicolorous, not ornamented with spots or fasciæ	5
Elytra testaceous with median fascia and scutellar spot black.....	10
5. Setigerous punctures numerous on first, third, fifth and seventh elytral intervals, thorax opaque	<i>opacicollis</i> .
Setigerous punctures entirely absent from first interval.....	6
6. Thorax bright orange red.....	9
Thorax more or less piceous.....	7
7. Only the third and fifth elytral intervals with setigerous punctures.....	8
Third, fifth and seventh elytral intervals with from six to ten setigerous punctures, elytra piceous, prothorax shining, indistinctly punctate.....	<i>robusta</i> .
8. Third and fifth elytral intervals with only a very few setigerous punctures; thorax indistinctly punctate; color piceous, with faint metallic lustre.	
	<i>gagatina</i> .

* Trans. Amer. Ent. Soc., vol. xv, p. 28.

Third and fifth elytral intervals with from six to ten setigerous punctures, thorax more visibly but finely punctate, elytra with distinct metallic blue lustre.

basalis.

9. Elytra blue, legs pale yellow *croceicollis.*

Elytra piceous with slight metallic lustre, legs yellowish to piceous.

resplendens.

10. Thorax orange, elytra reddish-testaceous with large scutellar spot, a fascia behind middle and suture more or less black..... *pulchella.*

***Statira simulans*, new species.**

Reddish brown, elytra and abdomen piceous black, opaque, elytra shining. Antennæ half as long as the body, last joint as long as the three preceding. Head and thorax scabrous, the latter as long as broad, with the sides arcuate, sinuate near base, causing the hind angles to appear very prominent, lateral margin rounded. Elytral striæ closely punctate, intervals slightly convex, the first, third, fifth, seventh and ninth intervals with an irregular row of setigerous punctures, the latter generally larger than those of the striæ. Body beneath smooth and shining. Tibiæ on the outer edge sulcate from base to apex. Length 7-9 mm.

Brownsville, Texas. Four specimens in the Museum of the Brooklyn Institute.

This species is very similar to *pluripunctatus* but is a little more robust and always has the elytra shining, the setigerous punctures coarser, thorax shorter and broader and the antennal joints stouter.

All the specimens examined seem to be females. There is no difference in the position of the eyes, the length of the last antennal joint or in the general form.

***Statira robusta*, new species.**

Piceous brown, head and underside piceous black, shining. Head sparsely punctate. Thorax as long as broad, arcuate in front, sinuate near base, lateral line distinct, surface shining and very finely punctate. Elytral striæ closely punctured, the third, fifth, seventh and ninth intervals with widely separated setigerous punctures. Body beneath smooth and shining. Tibiæ on the outer edge convex. Length 11 mm.

One female specimen from Globe, Arizona, which I owe to the kindness of Mr. Chas. Palm.

This species is larger and more robust than any of our known species; superficially it resembles the female of *opacicollis*, but the more robust form, the shorter and shining thorax and the absence of setigerous punctures on the first elytral interval readily separates it from that species.

***Statira pulchella* Mäekl.**

I have taken a few specimens of this fine species by beating vine overgrown bushes in Brownsville, Texas. The color is orange yellow,

elytra slightly paler with a large scutellar spot, a transverse fascia slightly behind middle and wider at sides than at suture, black. The thorax is subopaque and distinctly punctured and the usual setigerous punctures on the alternate elytral intervals are nearly absent; the tibiae are convex on the outer edge. In the Brownsville specimens the suture between the submedian fascia and apex of elytra is narrowly black and from the scutellar spot to the submedian fascia slightly infusate, while the Mexican specimens seem to have the suture more heavily black; otherwise the specimens agree very well with the description.

Class I, HEXAPODA.

Order IV, DIPTERA.

THE NORTH AMERICAN SPECIES OF CUTEREBRA.

By MYRON H. SWENK,

LINCOLN, NEBR.

Recently, while working over the bot-flies in the collection of the University of Nebraska the writer found among them three species of the genus *Cuterebra* which appeared to be new. Descriptions of these are submitted below, and, in order to show their relationship to our other species and to facilitate their identification, the following table to all the species which have been described from the mainland of North America has been prepared.

Thorax above with the pubescence yellow (1).

Thorax above black, or with black pubescence (5).

1. Scutellum with black pubescence (Wash.).....*scutellaris* Brauer.
1. Scutellum with yellow pubescence (2).
2. A large bare black space on the anterior disc (Ga., Mass.).....*cuniculi* Clark.
2. No such bare space on thorax above (3).
 3. Last segment silvery, with yellow pubescence (Mexico)..... *analis* Macquart.
 3. Last segment dark, with short black pubescence (4).
4. Abdomen blue-black (Ga., N. Y., Minn., Nova Scotia).....*horripilum* Clark.
4. Abdomen reddish brown (Nebr.).....*abdominalis* Swenk.
 5. Pleura mostly yellow or white (6).
 5. Pleura wholly black (15).

6. Abdomen more or less pollinose or pale pubescent (7).
6. Abdomen entirely destitute of pollen or pale pubescence (14).
 7. Pleura with a cluster of black hairs above center (8).
 7. Pleura without a cluster of black hairs above the center, though sometimes with bare black spots (12).
8. Face and cheeks densely gray pollinose, each side of face marked with four polished streaks (Mexico).....*histrio* Coquillet.
8. Face white pollinose with a black spot on lower margin of eye and another midway between it and the mouth (9).
8. Face not marked as above (11).
 9. Front above antennæ on each side with three silvery pollinose spots arranged in a triangle, the two outer ones contiguous to the orbit (Fla., So. Car., Pa., Ky., N. J., Mass., Minn., Nova Scotia).....*buccata* (Fabricius).
 9. Front above antennæ with the two lower spots coalesced into a transverse line extending from the orbit almost to base of antennæ (10).
10. Second abdominal segment with a basal tuft of white hairs on each side (Wyo.)
albifrons Swenk.
10. Second abdominal segment without such a tuft (N. M.).....*lepusculi* Townsend.
11. Abdomen with three basal segments partly brown pollinose laterally, leaving bare spots, elsewhere steel-blue (Cal., Wyo., N. M.).....*lepivora* Coquillet.
11. Abdomen with the fourth segment pollinose laterally (Ga., Ariz., N. M., Mexico).....*americana* (Fabricius).
12. Abdomen reddish brown, three last segments partly pollinose, with exposed spots (Cal.).....*latifrons* Coquillet.
12. Abdomen shining blue-black, only two last segments ever pollinose (13).
 13. Two last segments pollinose, with distinct bare spots (Ill., N. Y., Nova Scotia, Mexico) (= *emasculator* Fitch).....*fontinella* Clark.
 13. Penultimate segment with basal half whitish pubescent and with a few bare spots (Minn.).....*sterilator* Lugger.
 13. Penultimate segment, except apical margin, uniformly white pollinose and with long white hairs and no exposed spots, elsewhere entirely steel-blue (Nebr.).....*fasciata* Swenk.
14. Pleura with a cluster of black hairs above the center (Cal., N. M.)
nitida Coquillet.
14. Pleura without a cluster of black hairs above the center (Wyo.)
polita Coquillet.
15. Abdomen entirely destitute of pollen (Cal., Ore., Col., Wyo., S. D.)
tenebrosa Coquillet.
15. Abdomen with the sides of the three basal segments white pollinose (16).
16. Last abdominal segment more or less pollinose (Mexico) (= *terrisona* Walker)
atrox Clark.
16. Last abdominal segment entirely steel-blue, not pollinose (N. M.)
similis Johnson.

Cuterebra abdominalis, new species.

♀. Very close to *C. horripilum*. Head dull black, tinged with brown about ocelli and on a large triangular elevated space on each side, clothed with short black hairs which are much shorter and fewer on the brownish areas. A brownish pollinose

spot is just above the center of each anterior eye margin and contiguous to it. Vertex at narrowest point five times as wide as distance between the posterior ocelli. Facial depression shining black, its extreme basal depth slightly silvery pollinose. Antennæ deep brown, the arista and its hairs black except at extreme apex. Below the facial depression and covering the area between the mouth and lower eye margins is a yellowish pollinosity, relieved by a black spot contiguous to the lower apex of each orbit, another much larger one between this spot, and the mouth, and a black line which runs along each margin of the oral slit, widening to a spot posteriorly and connecting with the facial groove anteriorly. The area about the mouth is provided with long yellow hairs, especially posteriorly.

Thorax entirely covered with a long, very dense, brownish-yellow pubescence, longer in a tuft above the wings. Pleura similarly pubescent except for a large space above anterior coxæ which is merely yellowish pollinose with a large, exposed and bare, black spot. *Wings brownish. Legs black, with short concolorous pubescence, the femora more or less white pollinose at base exteriorly. Abdomen reddish-brown, shaped as in *horripilum*, the two basal segments clothed dorsally with long brownish-yellow pubescence, denser laterally; elsewhere the pubescence is minute and black. All the segments (only slightly on the second) laterally and below with yellowish pollen relieved by numerous small exposed spots of the ground color. Length, 23 mm. Width of head at vertex, 9 mm.

Type: One female, Lincoln, Nebraska, June. (R. H. Wolcott.)
Collection University of Nebraska.

In addition to the strikingly different coloration of the abdomen, the species differs from *C. horripilum* in the face marks as described and figured by Brauer, having but one orbital pollinose spot above, less silvery pollen in facial depression, a distinct black spot contiguous to lower margin of eye, etc.

Cuterebra albifrons, new species.

♀. Head dull bluish-black on vertex and upper portion of front, except for a brownish Y-shaped elevation surrounding ocelli and extending down the vertex, covered with short, scattered black hairs and a very minute and inconspicuous pale pubescence, the latter most noticeable just above the facial depression. Vertex at narrowest point five times as wide as distance between two posterior ocelli. On a level with the upper edge of the facial depression, and extending from the eye margins nearly to it are two transverse white pollinose bands, broadest at the orbits and extending in uniform width inward for one half their length, then by an abrupt incurving of the upper edge becoming a mere line and again abruptly widening into a subtriangular terminal knob. A short distance above these bands on each side is a small pollinose spot contiguous to the eye. On each side of the facial depression is a gourd-shaped black spot the neck of which connects narrowly with the black of the upper face, otherwise it is completely surrounded by a dense white pollinosity which covers almost the entire lower half of the face. The depression itself is white pollinose, without pubescence, and has a lanceolate black spot on each side of the lower margin. At the lower margin of the eye and contiguous to it is a black spot and between it and the

mouth is another slightly larger one. The pollinosity of the lower face extends behind the eyes to the vertex and is supplemented with a short white pubescence, for the most part thin but becoming long and dense around the margins of the cheeks and about the mouth, extending also upward from the mouth along the raised line to the facial depression. Antennæ with first two joints dark brown, the arista and its hairs blackish except on apical one third, which is pale.

Thorax above dark leaden bluish, without lustre, covered with a very short, thin, black pubescence, this becoming much longer and denser on the scutellum, which is fringed posteriorly with a short but very dense yellowish white fringe. Pleura and under surface of thorax with long, very dense, yellowish white pubescence, extending in a narrow fringe of short dense hair over the wings and along the margins of the thorax. A small tuft of black hairs is just above the center of the pleura, and two adjacent large bare spots are about midway between it and the anterior coxæ, on a pollinose spot bare of pubescence. Two similar spots are just above the intermediate coxæ, and on a similar pollinose spot. Just above the insertion of the posterior legs is a tuft of long black hair. Wings brownish hyaline.

Abdomen shining steel-blue, the basal segment bare, the second segment with a conspicuous tuft of white hair in each side near base, otherwise devoid of pubescence but with a white pollinose space on extreme sides, which is dotted with two or three small exposed dark spots. Following segments steel-blue dorsally but with lateral margins, especially at base, and entire under surface white pollinose, varied with numerous large, round, exposed steel-blue spots and a thin short black pubescence. Legs black, the femora brownish, with short black pubescence, the bases of the femora, especially on intermediate and posterior legs, whitish pollinose; on the posterior legs the femora have the basal half so, as well as the under surface of the tibiæ and the upper surface of the apical tarsal joints. Length, 19 mm. Width of head at vertex, 8.5 mm.

Type: One female specimen, Hecla, Wyoming (S. G. Clason).
Collection University of Nebraska.

This species is closely allied to both *C. buccata* and *C. lepusculi*, but apparently differs from either by possessing the pale hair tufts on the second abdominal segment. The face marks, especially the superior pollinose spots, seem also to differ from either.

Cuterebra fasciata, new species.

♂. Head black, slightly shiny, provided with very short, black hairs. A small triangular white pollinose spot is contiguous to the orbits on each side at upper level of facial depression, and another minute spot between it and the upper extremity of the depression, while still another is located contiguous to the anterior lower margin of each orbit. The extreme lower margin of the head between the eyes is white pollinose, but this is almost concealed by a long, very dense, white pubescence which forms a thick fringe, narrow laterally but widening medially to surround the mouth. The basins of the facial depression are pale silvery pollinose. Antennæ black, the apical two thirds of the arista and its hairs pale. Vertex at narrowest point three times the distance between two posterior ocelli.

Thorax above shining blue-black, clothed with short black hair, a line over the wings connecting with pleura and the pleura themselves covered with long, dense, matted, yellowish white pubescence, not varied with black spots. A dense black fringe around border of scutellum. Wings brownish hyaline. Legs black, shining, clothed with short black pubescence, not pollinose. Abdomen shining steel-blue, clothed with minute black hairs, not pollinose or pale pubescent except on penultimate segment which is, excepting the apical margin, uniformly white pollinose and clothed with long white hairs without exposed black spots. This white band extends over the entire segment and is very conspicuous and contrasting. Length, 16 mm. Width of head at vertex, 7 mm.

Type: One male, Lodgepole, Cheyenne county, Nebraska, July.
Collection University of Nebraska.

A very distinct species belonging to the *fontinella* group.

Cuterebra tenebrosa Coquillett.

The University collection contains a female from Hecla, Wyoming (S. G. Clason) and two males from Sheridan, Wyoming, taken August, 1900, which are referred to this species. They agree with Coquillett's description except in the face marks, for none of these specimens have any pollinose marks whatever on the face. This character, however, as the description intimates, is probably more or less variable in this species. Actual comparison with *tenebrosa* might show specific differences.

ILLUSTRATIONS OF THE ABDOMINAL APPENDAGES OF CERTAIN MOSQUITOES.

By HARRISON G. DYAR, A.M., PH.D.,

WASHINGTON, D. C.

(PLATE VIII.)

Grabhamia mitchellæ Dyar. (Plate VIII, Fig. 1.)

Side piece elongate, outer lobe undeveloped, inner lobe small, setose; clasp moderately swollen centrally though not greatly inflated, with long terminal spine. Harpe jointed, basal part rather straight, uniform, apical filament long, as long as the basal part, uniform, scarcely tapered. Harpago smooth, curved, concave, the tip narrow and bent. Unci invisible. Appendage of the eighth segment small, setose.

Grabhamia punctor Kirby. (Plate VIII, Fig. 2.)

Side piece elongate, terminal hairs very stout; outer lobe distinct, running basally to join the inner lobe, moderately setose; inner lobe well developed, expanded, setose; clasp filamentous with long terminal spine. Harpe jointed, basal part curved, uniform, outer filament broad, curved, not long, slightly recurved at tip. Harpago curved, concave, the tip narrow and bent. Unci invisible. Appendage of eighth segment short, broad, setose.

Grabhamia abfitchii Felt. (Plate VIII, Fig. 3.)

Side piece elongate, with stout hairs at apex; outer lobe present, short, prominent, setose; inner lobe well developed, long, running up to the outer lobe, setose throughout; clasp filamentous with long terminal spine. Harpe jointed, uniform, the basal part curved, filament straight, equal in length to the basal part. Harpago smooth, elongate, curved, concave, the tip narrowed and bent. Unci invisible. Appendage of the eighth segment narrow, long, with few setæ.

Grabhamia fitchii Felt & Young. (Plate VIII, Fig. 4.)

Side piece elongate, with stout hairs at apex; outer lobe present, short, prominent, setose; inner lobe prominent, short, sharply conic, very densely haired; clasp filamentous with long terminal spine. Harpe jointed, basal part straight, uniform, apical filament short, broad, with a notch at base with a slight prominence above it, the tip curved over. Harpago curved, concave, prominent, the tip narrow and curved. Unci invisible. Appendage of eighth segment distinct, broad, with many setæ.

Culicelsa confirmatus Arrib. (Plate VIII, Fig. 5.)

Side piece elongate, narrowed outwardly; outer lobe present, elongate, smooth, an area at its base bearing numerous dense long hairs; inner lobe small, setose, a broad stout spine arising near it which is bent at base and recurved at tip; clasp filamentous with long terminal spine. Harpe jointed, the basal part long, even, the apical filament long, expanded, with a sharp retrorse branch near tip. Harpago elongate, conical, the tip tapered and bent. Unci invisible. Appendage of the eighth segment broad, setose.

Anopheles crucians Wied. (Plate VIII, Fig. 6.)

Side piece conic, stout, a lobe within near base bearing two stout setæ; a second lobe within the first, conic, with triple stout apical setæ and two smaller ones on the basal slope. Clasp stout, long and broad, narrowed centrally, with a small terminal spine.

Filament of harpe slender, uniform *abfitchii*.

Filament of harpe broad, with a notch at base..... *fitchii*.

SYNOPSIS OF SPECIES OF *CULISELSA*.

Three species are now known to be referable to this genus. They separate as follows on genitalic characters.

Inner lobe of side piece broad and angled, but without a spine *tæniorhynchus*.

Inner lobe of side piece small, rounded, with a stout spine with hooked tip.

Side piece broad without *inconspicuus*.

Side piece narrowed without..... *confirmatus*.

The student will find a synopsis of genera of *Culicidæ*, based on genitalic characters in the Proceedings of the Entomological Society of Washington, vol. vii, pp. 42-49, 1905.

Class I, HEXAPODA.

Order V, LEPIDOPTERA.

NEW SPECIES OF NOCTUIDÆ FOR 1905, NO. 3.

By JOHN B. SMITH, Sc.D.,

NEW BRUNSWICK, N. J.

Bryophila viridimedia, new species.

Head black, vertex snow white. Thorax deep wine brown, the tip of the collar a narrow dorsal line and the posterior tuft white. Primaries with basal space deep wine brown; this shade being limited by the t. a. line which crosses the cell squarely, one third from base, runs back along the median vein and crosses the submedian interspace one fourth from base, and again extends outwardly along vein 1, crossing to the outer margin one third from base, through the green of the median space which extends below vein 1 nearly to the base of the wing; forming a square black spot on the inner margin. The median space is bright, mossy green, crossed centrally by a deeper green median shade. The orbicular spot is round, broadly white-ringed and edged by a few black scales. The reniform is centrally constricted, hour-glass shape, broadly white-ringed, edged with blackish scales. Beyond the reniform a subquadrate black spot fills the space between it and the t. p. line. The t. p. line is composed of black lunules, followed by a narrow white line, its course as a whole an even outcurve. There is no obvious s. t. line, yet there is a shading that indicates a division of terminal and subterminal spaces. On the costa is an oblong deep brown patch extending from t. p. line to the point of the s. t. line, leaving the apex pale with a greenish overlay; below that is a violaceous shading which, on the inner margin forms a violet brown blotch just before the anal angle. Along the outer margin is a bronze

brown shading which extends inward at the middle and thus completes a mottling of the outer fourth of the wing. The fringes are solid deep brown. Secondaries soiled whitish, smoky outwardly. Beneath: primaries smoky, paler along costa where the inceptions of the lines of the upper surface are marked in blackish; apex pale; secondaries whitish, powdery along the costa, smoky at apex, with a narrow smoky extra-median line and a small discal lunule.

Expands: 1.20 inches = 30 mm.

Habitat. — Cochise county, Arizona, June 24.

One male in very good condition from Mr. George Franck. A very beautiful species and a distinct acquisition to our fauna. It may be that when a revision of this group is made that this species will not be placed in the typical genus.

Genus *ACRONYCTA* Ochseneimer.

Since the publication of the Revision of this genus by Dr. Dyar and myself, considerable material has come to hand which has somewhat modified my opinion as to the standing of certain forms. Dr. William Barnes also was good enough to send me a large series for further comparison, which proves the distinctness of forms previously considered identical.

Acronycta obscura Hy. Edwards.

I have referred this as a synonym of *americana* but believe now that it is probably a good species. The material is scanty and, except for the fact that the range of variation is not so great as I concluded on a previous study, would not authorize changing the present status of the name. I have only a single example myself and know of no others except the types.

Acronycta denvera, new variety.

Closely allied to and probably a variety of *dactylina*. It differs in the more even, less powdery and somewhat creamy-tinted primaries which are really more nearly like those of *hastulifera*. The secondaries, however, are pale in both sexes and not much more powdered in the male than in the female. All the specimens, 2 males and 4 females, are from Denver, Colorado, and dated July, where they have any date at all. There is no difficulty whatever in separating the two forms where they are comparable in sufficient numbers.

Acronycta eldora, new species.

Belongs to the *americana* group and is a close ally of the typical species. The median lines are well defined, geminate, powdery, black rather than brown, the t. a.

line tending to become obscure. There is no basal streak, but the dagger mark is distinct in every specimen; usually it extends outwardly from the inner portion of the t. p. line; but it may be extended a little inwardly as well. The ordinary spots are of good size but tend to an irregularity in form, the orbicular becoming elongate to the extent of fusing with the reniform. The ground color of primaries is whitish gray, powdered with black scales so as to give an impression of thin scale covering, less marked in the female than in the male. Secondaries in the male are whitish with a diffuse extra-median dusky line; in the female with a fuscous or yellowish tinge.

Expands: 2.00-2.40 inches = 50-60 mm.

Habitat: Denver, Colorado, in July; Glenwood Springs, Colorado, July and August.

Eight examples in good condition and evenly divided as to sex. One pair is from Denver and were received years ago, probably from Mr. Bruce; the others are from Dr. Barnes. In 1898, with only one pair at hand, I believed this to be a local variation; comparing the specimens in Dr. Barnes' collection last spring he declared his belief that they were specifically distinct; a belief which I now share after closer comparison with additional material.

Acronycta similana, new species.

Ground color a blackish powdery gray, like a dense black powdering over a whitish base. Orbits of the eye and base of antennæ white, head and disc of thorax otherwise the darkest portions of the insect. Primaries with a slender black basal streak, forking at the t. a. line which is indicated at the costa and on the inner margin. T. p. line continuous, lunulate in part, blackish, preceded by white shadings. Preceding the line in the submedian interspace is a more diffuse dark shading, through which a slender black streak crosses the t. p. line, forming a dagger mark. Fringes whitish, narrowly cut with blackish. Orbicular obscure, narrowly blackish ringed. Reniform a blackish blotch. Secondaries white with blackish sparse powderings, veins narrowly fuscous. Beneath, whitish with black powderings, each wing with a vague exterior line and a blackish discal spot.

Expands: 1.75 inches = 44 mm.

Habitat. — Chicago, Ill., June 15, Mr. A. Kwiat.

At first sight suggests a suffused *populi*; but the line of variation does not run that way in *Acronycta*, and though there is only one good male before me, Mr. Kwiat informs me that several others have been taken. I therefore prefer to consider this a good species at present.

Acronycta sperata, race *speratina*, new.

A series of 10 males and 2 females from Colorado shows some interesting differences from the type, albeit none departs for a consid-

able distance beyond what we would consider typical. With only a few examples at hand a new species is indicated: with a good series the existence of a very distinct form is obvious, and this I have called *speratina*.

It is somewhat larger, more heavily built and, on the whole, paler, more ashen gray in color than the type: the maculation is more diffuse, less definite and altogether more obscure than is usual in eastern examples.

Expanse as in the type.

Habitat. — Denver, Colorado, in July; Dr. Barnes.

Acronycta cæsarea, new species.

Head, thorax and primaries ashen gray, powdery, the dusting smoky olivaceous with a slight bronze lustre. Base of antenna with white scales and a white line at base of collar. Primaries with the median space a little paler than the rest of the wing, the markings fairly distinct, but the impression on the whole is one of uniformity. Basal line geminate, powdery, blackish, both portions equally defined. T. a. line geminate, black, the parts equally defined, included space broad, very even and outwardly oblique. The veins through the basal space are black marked and there is a little inward tooth from the middle of the t. a. line, but no basal streak or dash. T. p. line with a long outcurve over the cell and a well-marked incurve below; geminate, the inner portion smoky, partly lunate, the outer chiefly marked by the darker shade of the s. t. space, which, indeed, extends to the fringes. A vague s. t. line or shade is indicated by some irregular whitish blotches. Orbicular round, whitish with a dusky center. Reniform of good size, broadly kidney-shaped with a whitish spot and a central lunule. Secondaries uniform smoky, the veins a little darker; discal spot and shade of under side faintly visible. Beneath, primaries very dark smoky, somewhat blotchy; secondaries whitish, powdery along the costa, the veins blackish, a broken blackish outer band and a distinct discal spot.

Expands: .95 inches = 24 mm.

Habitat. — Essex County Park, N. J., May 20.

One good male from Mr. W. D. Kearfott. The species is smaller and narrower winged than *retardata*, which it otherwise resembles in a general way. The very uniform ashen gray and the small ordinary spots will further serve to distinguish the species.

Aplectoides speciosa, variety *arctica* Zetterstedt.

Hampson, in his monographic work, makes "Ab. 2 *arctica*. Small and dark with the markings indistinct. Alpine and Arctic." I have seen alpine specimens that agree with this characterization; but have in hand now a male example from Mt. Rainer, Washington, which is very dark, almost blackish, the markings indistinct, but equals in size the typical form. Besides being indistinct, or better

indefinite, the markings are reduced and increased in contrast, the inclosed parts of the median lines and filling of the ordinary spots being white. The species is not common in collections at any time and the occurrence of this unusual form in a new locality is worthy of note; hitherto the species has not been recorded at all from the Pacific coast, so far as I am aware.

***Aplectoides arufa*, new species.**

Resembles in general appearance *A. imperita*, but has none of the reddish or brown shadings of that species and is altogether less marked. The ground color is a dull fuscous gray, the markings darker, emphasized by a few black scales only, and there are none of the contrasts that make the eastern species so recognizable. The median space is concolorous, the median shade is vaguely defined, and there are no black marks on the s. t. line; but the terminal lunules are large and distinct. The secondaries are smoky, whitish at base, with a broken terminal line, a dusky discal lunule and a smoky extra-median line.

Expands: 1.50 inches = 37 mm.

Habitat. — Yellowstone Park, Wyoming, in August.

One good male. The relationship to the eastern species is obvious; but so is also the difference. I have *imperita* from Labrador that are smaller with much more sharply defined markings than my example from Mt. Washington and, while the New Hampshire specimens differ among each other, none of them vary in the direction of *arufa*.

***Aplectoides fales*, new species.**

Head, thorax and primaries a rather even smoky gray, with a slight olivaceous tinge. Head and collar somewhat paler, with a slight reddish admixture. Dorsal tuftings of thorax with a brown shade; patagia well marked. Primaries without strong contrasts, all the maculation traceable, the ordinary spots and an area between reniform and s. t. line on costa more whitish. Basal line distinct, geminate, blackish, with whitish included space. T. a. line geminate, outer defining portion blackish, inner smoky; included space ashen gray; as a whole the line is outwardly oblique, a little curved, with small outcurves in the interspaces. T. p. line geminate, inner portion blackish to black, lunulated; outer portion obscure or smoky, crenulated, included space gray; as a whole the line has only a slight outcurve over the cell and only a very little incurve below it. S. t. line gray, a little irregular, preceded by a distinct black shade which becomes inwardly diffuse and is the most conspicuous portion of the wing. There is a slender, lunulate black terminal line. A vague median shade darkens the space between the ordinary spots and part of the outer portion of the median space. Claviform concolorous, small, pointed, narrowly black lined. Orbicular large, pale gray, not defined above, broadly V-shaped. Reniform moderate in size, kidney-shaped, gray, rather well defined by a narrow black line. Secondaries an even smoky gray, the fringes white. Beneath pale gray, powdery, both wings with smoky outer bands and smoky discal spots.

Expands: 1.42 inches = 35 mm.

Habitat. — Calgary, Alberta, July 2, '96.

Probably received from Mr. Dod though the specimen does not bear his label. It is a broad-winged form more like *imperita* than *pressa* and yet not unlike an obscurely marked *pressa*. I have hesitated long before describing it and do so now only because this may be really the male of the following species — *discolor* — despite the differences in wing form and maculation.

***Aplectoides discolor*, new species.**

Head, thorax and primaries very pale gray, almost white, powdered with black. Head immaculate, collar with a vague dusky line across the middle. Thorax powdery, patagia obscurely submargined. Primaries irregularly shaded and powdered, with conspicuous contrasts and varying greatly. Basal line geminate, marked on costa, blackish. T. a. line geminate, not well defined, as a whole outwardly oblique and with a little outcurve. T. p. line geminate, obscure, marked only by pale included space or by occasional smoky or blackish scales; as a whole a little outcurved over the cell and a little incurved below. S. t. line white, a little irregular, preceded by a more or less continuous black shade which becomes diffuse inwardly. A series of small black terminal lunules. An obscure median shade. Space before and between the ordinary spots is the darkest part of the wing, a black bar connecting the spots inferiorly. Claviform large and broad, incompletely outlined. Orbicular large, round or oval, black margined, center with or without a dark spot. Reniform moderate in size, kidney-shaped more or less completely outlined, the center powdered with blackish. Secondaries whitish with a smoky suffusion which forms an obscure submarginal band and discal lunule; the fringes white with a dusky line at base. Beneath gray, powdery, with a more or less obvious extra-median line and discal spot.

Expands: 1.55–1.65 inches = 39–41 mm.

Habitat. — British Columbia; Inverness, July 16; Mouth of Skeene River, June 29.

Two females received from Dr. James Fletcher, both somewhat defective and illustrating extremes in ornamentation. The ground is white in both cases: in one specimen the cell except for the ordinary spots is well darkened, but as for the rest the powdering is scant and scarce sufficient to mark any except the s. t. line; there is merely a vague mottling. In the second specimen the black is diffused over the entire wing and the ordinary lines are marked by the white included spaces. The wing form is like that of *pressa* and the paler specimen might at first be mistaken for that species or yet more easily for *condita*. Although *fales* may possibly prove to be the male of *discolor* it would be the first instance in this genus of a sexual difference in wing form.

***Rhizagrotis perolivalis*, new species.**

Head, thorax and primaries gray, overlaid by a dark olive. Head with white scales intermixed and with the lower half whitish. Collar whitish below a median black transverse line, and sometimes white tipped. An oblique white line on the patagia from the costal insertion of primaries to the anterior divided crest; edges of patagia also white in one specimen. Primaries with the costal region whitish to the t. p. line and the s. t. space with whitish powderings. Basal line distinct, white, with black scale edgings. T. a. line white filled, outwardly defined by a broad, somewhat diffuse black line, inwardly by a smoky line; in course almost upright to the submedian vein, outcurved in the interspaces, with a long outward bend below vein 1. T. p. line almost parallel with the outer margin; geminate, outer line incomplete, narrow, even; inner line narrow, a little crenulate, blackish, included space more or less whitish. S. t. line of the pale ground or whitish, preceded by black sagittate spots so arranged as to give the appearance of white rays on veins 3 and 4 and 6 and 7. A narrow black terminal line. There is a black edging below the median vein in the basal space. A yellow bar extends from the end of the claviform to the t. p. line. Claviform concolorous, narrow, rather elongate, edged with black. Orbicular narrow, oblique, black-edged, white filled. Reniform kidney-shaped, rather narrow, black-edged, whitish powdered. Secondaries pale smoky yellowish, outwardly darker, the fringes white. Beneath gray, powdery, especially toward the margins.

Expands: 1.36-1.40 inches = 34-35 mm.

Habitat. — Calgary, Alberta, head of Pine Creek, July 9, 10, 14.

One male and three females, all in good condition from Mr. F. H. Wolley Dod. The species has a close superficial resemblance to the *4-dentata* series of *Euxoa*, and with only the female at hand I associated it with *olivalis*. The receipt of the male and of additional females makes it possible to determine the genus in which the species has no close allies, superficially. It may be that *terrealis* which I referred to *Chorizagrotis* will eventually be associated with this species in *Rhizagrotis* or that because of the general agreement in type of maculation, *perolivalis* will go to *Chorizagrotis*.

***Noctua acarnea*, new species.**

Head and collar deep, almost purplish brown; collar with a blackish transverse line; disc and thorax more reddish, patagia almost carneau, and much brighter than any other part of the insect. Primaries very dark, almost blackish brown, with a purplish tinge, with a reddish shade in the upper portion of median space, most obvious in the reniform. Basal line geminate, broken, outer part of line blackish, inner obscure, included space reddish; as a whole, nearly upright. T. p. line obscurely geminate, irregular, with an even and not very marked outcurve. Inner part black-marked, emphasized by some reddish scales following. S. t. line somewhat irregular, reddish, punctiform, a little emphasized by darker shadings. Fringes concolorous. Claviform small, incompletely outlined, obscurely shaded with reddish.

Orbicular large, round, concolorous, edged by black scales and some reddish powderings. Reniform large, kidney-shaped, filled with reddish powderings; edged with black scales; the space between the spots somewhat darker. Secondaries dull, pale, smoky yellowish, tips of fringes paler. Beneath smoky gray, powdery.

Expands: 1.56 inches = 39 mm.

Habitat. — Banff, Alberta; N. B. Sanson, "Museum," July 11, 1902.

One good male, received through the courtesy of Dr. James Fletcher. The species is an obvious ally of *bicarnea*, with a similar excavation in outer margin of secondaries below apex; but it lacks the characteristic shadings and the details of maculation, especially in the ordinary spots, are quite distinct.

***Euxoa sotnia*, new species.**

Ground color very pale gray with a luteous tinge, densely powdered with black scales, especially in the female. Collar usually with a more or less obvious transverse line; but that is often wanting. Thoracic vestiture a mixture of fine and flattened hair, varying somewhat in proportion; the collar, patagia and crests well marked in good examples; but not prominent. Primaries rather narrow, elongate with the apex more reduced than usual; all the lines present, but broken and more or less obscured by the powdering. Basal line geminate, obscurely marked. T. a. line upright, or only a little oblique, a little outcurved in the interspaces; geminate, inner line tending to become lost, outer diffuse, more or less broken; sometimes the entire line hardly traceable. T. p. line geminate over costal region, abruptly bent over cells then very even to the inner margin, the inner line more or less diffuse, sometimes nearly even, sometimes lunulate and sometimes crenulate; but always traceable. S. t. line irregular, always traceable, variably distinct; sometimes defined by an even dusky terminal space; sometimes also by a preceding shade; occasionally only picked out by light scales. Apex usually concolorous, the inception of s. t. line on costa often preceded by a blackish shade. A series of terminal dots or small lunules is often present; but as often wanting. Fringes variable. There is a diffuse dusky median shade that darkens the cell between the ordinary spots, and then runs close to and parallel with t. p. line, often darkening the outer part of median space. This shade is variably developed but always recognizable in some form. Claviform wanting. Orbicular round, varying in size, rarely defined, sometimes concolorous; sometimes discolored; rarely with a dark center. Reniform of good size, kidney-shaped, never completely defined, sometimes scarcely traceable. Secondaries white, with a narrow dusky edging in the male: in the female they are sometimes equally immaculate; but the tendency is to a smoky outer border beyond an extra-median line, and sometimes a discal spot is also traceable. Beneath, more or less powdery, sometimes almost immaculate, ranging to forms in which the disc of primaries is blackish, and there is an obvious extra-median line on both wings.

Expands: 1.15-1.38 inches = 29-34 mm.

Habitat. — Stockton, Utah, September 9-24.

A series of eight males and nineteen females, mostly fair, from Mr. Tom Spalding. The species is variable as has been indicated in the description, and it has no very close allies. At first sight it looks like *alcesta*; but the median shade separates the two and the narrower, more pointed primaries are also characteristic.

***Euxoa alcesta*, new species.**

Ground color very light yellowish ash gray, sometimes with a faint reddish tinge, irregularly and rather sparsely powdered with coarse blackish atoms. Head and thorax concolorous, collar sometimes with a defined subapical line. Thoracic vestiture mostly flattened hair, collar and patagia not well defined, the crest obscure. Primaries with the lines all geminate, all broken and no contrasts. Basal line marked on costa and below median space. T. a. line a little oblique outwardly, only a little irregular; outer portion of line best marked. T. p. line with the outer line vague, inner more or less crenulate, course nearly parallel to outer margin. S. t. line pale, irregular, tending to form dents at its middle, marked by the uniformly darker terminal space and, sometimes, by a preceding dusky shade as well. There is a series of small black terminal lunules, followed by a yellowish line at base of fringes. Claviform wanting in all examples before me. Orbicular round, of moderate size, imperfectly defined, concolorous with ground. Reniform obscurely marked, apparently of good size and kidney-shaped. The cell between these spots is more or less darkened and sometimes even black. Secondaries white in the male, with a very narrow dusky edging. In the female the wings are a little soiled, and there is a tendency to an extra-median line. Beneath whitish, with a more or less obvious common line and a discal spot, both best marked on primaries.

Expands: 1.24-1.50 inches = 31-35 mm.

Habitat.—Stockton, Utah, Sept. 5-26.

Ten males and six females from Mr. Spalding, all in fair condition. There is not much variation save in the matter of powdering, which brings out a little more or less contrast, locally or generally. The relationship is in part to *candida* and in part to *pallipennis*; the former is more chunky and the marking is not well defined; the latter is even in color and does not have the powdery surface.

***Euxoa anacosta*, new species.**

Ground color ashen gray, with a brown tinge, which is more obvious in the male than in the female, and gives the prevailing shade of the male primaries. Head paler than the ground, immaculate or with an obscure frontal line. Collar concolorous with head and costal region inferiorly, this pale shade limited by a more or less obvious black line across the middle, the upper half concolorous with thorax. Thorax more or less mottled with smoky brown, differing in shade, not maculate, usually the darkest portion of the insect. Primaries with costa as pale as the palest part of the disk, but not contrasting. The terminal space is evenly smoky and the darkest part of the wing; a dusky shade extends through and a little below the cell, and some

cases the entire median space is darkened. There is a variably distinct basal black dash, always broken by the basal line and rarely extending to the t. a. line. Basal line geminate, marked on costa and below median vein only. T. a. line geminate, defining lines blackish, broken, outwardly oblique and outcurved in the interspaces. T. p. line geminate on costa, outer line lost over cell, inner line crenulate, tending to become lost in the male, outwardly bent on costa and then evenly oblique below. Apex pale, breaking the pale irregular s. t. line which is preceded by a variable number of black sagittate marks. A series of small black terminal lunules. Fringes concolorous, with a very narrow pale line at base. Claviform narrow, pointed, extending to the middle of the median space, outlined in black, the concolorous center sometimes very narrow. Orbicular varying from round, complete, to oblique, oval or oblong; closed or open on costa; white ringed, the ring edged with black scales, the center of the palest ground. Reniform of good size, kidney-shaped, white ringed, edged with black scales, center usually pale. Secondaries white with a narrow dusky edging in the male, thinly smoked in the female, darkening outwardly to the white fringes.

Expands: 1.20-1.50 inches = 30-37 mm.

Habitat.—Stockton, Utah, Sept. 20-25.

Eleven males and about eighty females, collected by Mr. Tom Spalding. The species resembles *segregata* and was separated from a mixed lot of over five hundred examples, all of which were believed to be one species. As compared with *segregata* the new species does not have the contrasting costa and collar, and the contrasts of the disc of primaries are lacking. Altogether this is a more quietly marked form in which the transverse maculation is much better developed. The contrast between the sexes is well marked and the male is altogether brighter than the female.

Euxoa bialba, new species.

Head and thorax ranging in color from reddish gray to deep purplish brown, head sometimes paler, sometimes concolorous; collar usually with an obvious transverse black line, sometimes paler inferiorly. Primaries brown, variably overlaid by lilac gray, darker over costal region and in terminal space, ordinary spots brought into relief by the black filling between them. Basal space usually a little paler than the rest of the wing, basal line usually distinct, geminate. T. a. line geminate, black, the lines narrow, usually well defined, inner often wanting, only a little oblique, with three almost equal outcurves in the interspaces. T. p. line geminate on the costa, not well defined, and usually lost over the cell; sometimes traceable as a crenulate smoky line parallel with outer margin. S. t. line pale, narrow, a little irregular, marked by a preceding costal shade as against the pale apex, and below that by the usually darker terminal space. There is a narrow, somewhat lunulate blackish terminal line and a narrow yellow line at the base of the brownish fringes. Claviform narrow, short, rarely outlined, sometimes indicated by a few scales only. Orbicular large, round or oval, concolorous or paler, rarely dark centered, edged with black

scales. Reniform kidney-shaped, large, incompletely defined outward and inferiorly, concolorous or a little dusky below. The space between the spots always darker and sometimes black, contrasting. Secondaries white in the male, only a little smoky outwardly in the female. Beneath pale, powdery, primaries always darker and sometimes quite smoky, always with a discal spot and sometimes with a partial exterior line; secondaries usually powdery along the costa only, sometimes with a discal spot, not rarely uniformly whitish.

Expands: 1.12-1.40 inches = 28-35 mm.

Habitat. — Stockton, Utah, September 9 to October 2; Volga, South Dakota, without date.

Seven males and ten females; most of them more or less defective, from Mr. Tom Spalding and Mr. P. C. Truman. The species resembles *albipennis* and is a close ally. It differs in that the sexes are similar and the female is not darker than the male. It is more than probable that many of the western *albipennis* will be found referable to this species, and that the true *albipennis* with the darker female, = *nigripennis*, will be found to be an eastern and northeastern species.

***Euxoa zembla*, new species.**

Ground color a dull, luteous gray with white and blackish powderings. Head and thorax concolorous, varying as the amount of light and dark powdering varies, and sometimes forming obvious transverse lines on the collar. Primaries with all the maculation present but not distinct, everything seeming rather diffuse from the powderings. Basal line geminate, outer line broader and darker, on the whole outwardly oblique, outcurved in the interspaces, the curves unequal. T. p. line geminate on the costa, the outer line lost in the outcurve, inner line lunulate, the points being emphasized so that it sometimes is almost crenulate; rather abruptly bent on the costa and very evenly oblique from the outcurve to the inner margin. S. t. line pale, chiefly marked by the darker terminal space and sometimes by preceding shades or spots which become most obvious above the hind angle and opposite cell: sometimes veins 3 and 4 are a little indented, but that is a variable feature. There is a row of black terminal lunules, beyond which there is a pale line at base of fringes. A median shade-line darkens the space between the ordinary spots and then runs close to and parallel with the t. p. line; but that is a variable feature, and sometimes wanting. Claviform small, variable in form and in distinctness of outline, never contrasting. Orbicular varies from round to oval, sometimes complete, sometimes open above, with narrow black outline and a broader, more obvious whitish annulus; the center concolorous. Reniform of good size, kidney-shaped, a little oblique, defined like the orbicular. Secondaries in the male white, with a narrow dusky edge and the veins a little smoky; in the female usually a little smoky throughout, becoming darker outwardly, fringes white. Beneath powdery, primaries quite dusky, all wings with a discal spot.

Expands: 1.25-1.46 inches = 31-36 mm.

Habitat. — Stockton, Utah, Sept. 4-22.

Four males and nineteen females, mostly in good condition, from Mr. Tom Spalding. This species reminds one somewhat of *pleuritica* and belongs in the same group. The antennæ are rather broadly fringed in the male and the primaries are rather narrow, with somewhat marked apices.

***Fishia betsia*, new species.**

Head, thorax and primaries bright ashen gray with fine black powderings which give it a slightly bluish tinge. Collar with a black median line. Patagia with a distinct black line at base of wings and an obscure darker margin along the disk. Primaries with a black basal streak, sharply defined above, a little diffuse below, which extends well into the median tooth of the t. a. line. T. a. line single, black, broken, slender, with three long outward teeth, the first of which touches the orbicular, the second meets an inward tooth of the t. p. line and the third, least marked of all, reaches the middle of the median space. The t. p. line is vaguely indicated by a paler shading only until opposite the cell; then a series of black interspaceal streaks and a few black scales indicate the presence of the line to vein 2, below which there is a distinct black inward tooth which meets the t. a. line. There is a series of black terminal lunules at the base of the interlined fringes. Claviform concolorous with a fine black outline, extending above the median tooth of the t. a. line to the t. p. line. Orbicular large, oblique, a little paler than the ground, bordered by black scales at its anterior margin only. Reniform upright, oval, of moderate size, a little paler than the ground, very ill defined. Secondaries white, the veins a little dusky, with a series of blackish terminal lunules and a reflected round discal spot. Beneath whitish, with gray powderings; both wings with a round discal spot of moderate size.

Expands: 1.50 inches = 37.5 mm.

Habitat. — Stockton, Utah, October 4, 1904, Spalding.

One male in good condition; the female will probably be found to be larger, darker, with better defined maculation. The species differs from all those heretofore described by the very light ashen gray primaries and clear white secondaries. *Exhilarata*, its nearest ally, is distinctly darker and with heavier markings. I have seen a female collected by Mr. Spalding, October 6, 1903, which agrees in all respects with ♀ *vinela*, the ♂ of which bears no resemblance to the new form.

***Mamestra tufa*, new species.**

Ground color bluish pale gray with slight brownish tintings. Head with a frontal line, collar with a median band, disc of thorax powdery, without obvious markings. Primaries narrow, elongate, pointed, the outer margin notched. All the transverse maculation except s. t. line broken, obscure, though the course of the strongly angled t. a. line can be made out in part. S. t. line whitish, broken, very close to outer margin which is reached by the w on veins 3 and 4, preceded by blackish brown shadings which are most obvious opposite the cell and above anal angle.

There is an obscure black line, broken into scales through the submedian interspace, best marked at base. The ordinary spots are fused inferiorly, the lower and outer margin of the combined spot shaded with deep brown, the upper and inner tending to obsolescence. As a whole the wings look strigate without actually being so. Secondaries white. Beneath white, with a little blackish powdering, most obvious on primaries.

Expands: 1.55-1.60 inches = 39-40 mm.

Habitat. — Stockton, Utah, August 30.

Two male examples, neither of them very good, collected by Mr. Tom Spalding. One of them, from Dr. Barnes, is labelled '02; the other, from my own material, is labelled '04; the inference is that the species is not common. This species is an ally of *nugatis* and the smallest of the *purpurissata* type. It is an exaggeration of the *juncimacula* style of maculation and agrees with *nugatis* in the white secondaries. The yet narrower primaries, much lighter bluish gray color and the differences in details distinguish it from the latter species.

Mamestra agnata, new species.

Ground color a rather uniform ashen gray, a little darker in the female than in the male. Collar with a distinct black cross-line, patagia with black submargin. Primaries with all the lines and marks cleanly defined and complete, yet nothing contrasting except a lunule in the s. t. line above the anal angle, which is white and relieved by a preceding blackish shade. Basal line geminate, blackish, irregular. T. a. line geminate, outer portion usually more obvious, a little outcurved, even or a little outcurved in the intervals. T. p. line almost evenly bisinuate, inner line broader and barely lunulate. S. t. line whitish, making two rather even outward curves with an angle between them, emphasized by a dusky following shade and in the s. m. interspace as already described. A black, scarcely lunate terminal line. A yellow fine line at the base of the long fringes which are cut with blackish. There is a median shade which darkens the space between the ordinary spots and extends below to the inner margin. Claviform moderate or small, black margined, and beyond and partly over it is a reddish brown shading, the only patch of color in the wing, and that not always present. Orbicular moderate or large, round or a little irregular, black edged, annulate with pale gray, center concolorous or nearly so. Reniform upright, of good size, black margined, with a pale interior ring, and the disc paler than the ground, but not contrasting. Secondaries a little smoky in the ♂, decidedly so in the ♀; even in both cases. Beneath, gray, powdery, darker in the female, a common extra-median line and on the secondaries a discal spot.

Expands: 1.25-1.35 inches = 31-34 mm.

Habitat. — Redington, Arizona.

Three males and two females from Dr. Barnes, all in good condition and all without date. This species has the antennæ in the ♂ marked and bristle tufted, and is an ally of *M. gnata* Grt., which

occurs in the same faunal region. It differs materially, however, in the clearly written maculation and in the entire absence of the color characters of Mr. Grote's species.

Mamestra basiplaga, new species.

Dull fuscous brown, powdered and suffused with blackish. Head and collar paler, more reddish; head with a median cross line, collar with a black band at about middle, above which it is often of the darkest thoracic shade. Disc of thorax varies from a brown mottling to a blackish purple. Primaries with the upper half of basal space and the s. t. space generally, shaded or suffused with reddish brown in the male, this verging toward lilacinous toward the inner margin. Basal line geminate, obscure, usually traceable to a black longitudinal streak which extends almost to the t. a. line and is obvious in most specimens. Another black streak along inner margin at base, seems to be less constant. T. a. line geminate, inner line obscure, outer blackish, as a whole very irregular in course, nearly upright. T. p. line geminate, obscure through the brown area beyond the reniform, distinctly though not strongly incurved in the s. m. interspace. S. t. line irregular, broken, whitish, partly defined by the dark terminal space and in part by the preceding smoky blotches. A black line at base of fringes, which are cut with yellowish-brown. Claviform broad, rather short, triangular, concolorous, defined by a black outline, a black line generally extending from it to the t. p. line. Orbicular round or oval, usually pale ringed; but this varies greatly as does also the filling. Reniform small, oval, narrow, oblique, outer portion always white lined, usually edged with black scales, so that the outer margin stands out by contrast. Secondaries in the ♂ whitish at base, becoming dusky toward outer margin at apex; in the ♀ smoky fuscous throughout except at extreme base. Beneath, primaries smoky, darkest in the ♀; secondaries whitish, powdery along the costal area, with a discal spot.

Expands: 1.12-1.16 inches = 28-29 mm.

Habitat. — Huachuca Mts., and Southern Arizona, Poling.

Three males and six females, all from Dr. Barnes. No two are alike, and yet all have a similarity of habitus that brings them together. The general reference is to the *vicina* series, which the male genitalia seem to bear out from such examination as I could make of the specimens.

Mamestra imbuna, new species.

Dark ashen gray, head and lower half of collar often with a reddish tint, primaries with usually a reddish flush beyond the reniform. A distinct black line below the apex of collar. Patagia more or less obviously submargined with black. Primaries with a short curved black streak at base, above which the wing is usually a little lighter. T. a. line rather well removed from base; geminate, even, the outer line best marked, included space gray, as a whole with an oblique outcurve. T. p. line geminate, slender, the inner portion blackish, included space narrowly gray, outer portion often lost; as a whole even, with a wide bend over cell and a marked constriction in the submedian interspace. S. t. line irregular, broken, preceded by

variably defined dusky spots and sometimes by darker shades; just before the anal angle rather prominently marked by white scales. There is a narrow black line at the base of the fringes which are dark and narrowly cut with yellowish. Claviform large, conical, black-ringed, extending across the median space, the apex on the t. p. line. Orbicular large, irregular, oblique, black-ringed, the center concolorous or a little paler, the anterior margin resting on the t. a. line or connected with it by a black shading. Reniform large, extending above and below the cell, rather narrowly kidney-shaped, both ends resting on the t. p. line. Secondaries in the male whitish, becoming blackish at the margins; in the females more evenly smoky as a rule. Beneath primaries dark smoky brown, powdery; secondaries whitish in the male, darker in the female, powdery, with an outer line which in the female tends to become the inner margin of a distinct dark border.

Expands: 1.20-1.34 inches = 30-34 mm.

Habitat. — Lucerne County, Pennsylvania, in April; Hessville, Indiana, August 14.

Four males and 4 females in fair condition are at hand. Seven of the examples were received from Mr. George Franck and the females are uniformly darker and have the primaries broader than the male. The eighth specimen is a female, received from Mr. Kwiat, which is in all respects like the Pennsylvania males and shows none of the color differences above noted. The species is allied to *vicina* in wing-form and has a well marked excision below the apex of secondaries.

***Mamestra uliginosa*, new species.**

Dull blackish brown to blackish, powdered, and marked with white. Head and thorax more gray, powdery, head with one or two transverse darker lines; collar with a black median line; patagia with dark margins. Primaries with the maculation all present and more or less relieved. The ordinary spots whitish, more or less contrasting, and form the most obvious features. Orbicular round, moderate in size, with a central dusky spot. Reniform large, broad, upright, oblong, a little constricted in center, more or less mottled. Basal and s. t. spaces more or less mottled, median space more uniform. Basal line geminate, blackish, filled with whitish scales. T. a. line geminate, outwardly oblique, only a little curved or waved, intervening space more or less powdered but not filled with white. T. p. line makes a rather even and irregular bend over the cell and a little incurve below: it is more or less white-marked but not distinct and tends to become obscure. S. t. line irregular, broken, composed of white scales and not defined. The claviform is black-margined, concolorous, of moderate size, and in no way relieved. Secondaries in the male white, in the female muddy or smoky, with a tendency to yellowish; fringes white. Beneath, powdery; almost white in the male, dull smoky gray in the female; primaries darker in each case, secondaries in the female tending to an outer line and discal spot.

Expands: 1-1.20 inches = 25-30 mm.

Habitat. — Southern Arizona, Poling; Kerrville, Texas, Dr. Barnes.

Two males and three females in good or fair condition, none of them dated. The sexual difference is well marked in this species, which is allied to but not of the *olivacea* series. It is a more obscure form, and the tendency seems to be rather to a blackish base on which the ornamentation is picked out with white scales.

***Leucania ferricola*, new species.**

Ground color of head, thorax and primaries a thin rusty red over creamy yellow. Head and thorax more rusty, apparently immaculate; but the thoracic vestiture is compressed and so a little obscured. The primaries have the *albilinea* type of maculation. There is a distinct pale s. t. line which does not extend to the costa, and beyond that the terminal space is bluish; this tint running out to a point below the apex. There is a series of black terminal lunules and beyond it a brown line at the base of the fringes. A brown shade in the cell starts at basal fourth and widening, fills it, including the small black reniform and extending to the s. t. line. There is a short black streak from base along the median vein. There is a black shading below the submedian at base, changing to a brown which reaches the s. t. line; the brown shade limited above by a black streak through the middle of the submedian interspace. There are black dashes in brown clouds in the interspaces before the s. t. line. Secondaries pale with a reddish tinge, a narrow dusky terminal line and a dusky discal spot. Beneath, distinctly yellowish; the costal margins powdered with brick red, and each wing with a small blackish discal spot.

Expands: 1.12 inches = 28 mm.

Habitat. — Cochise County, Arizona, in July.

One male in very good condition except for the crushed thorax, from Mr. George Franck. The species is the most brilliant of those belonging to this series and has every detail of the maculation perfectly defined.

***Luperina extensa*, new species.**

Head, thorax and primaries dull brown, with a somewhat luteous tinge as a base. Palpi, head in front and base of collar a little more yellowish in tinge. Abdomen a little lighter, more yellowish. Primaries with the transverse maculation tending to obsolescence. There is a yellow streak through the submedian interspace that extends from base, where it is inferiorly marked by black scales across the t. p. line, and is lost just before the s. t. line. This streak is not contrasting, though perfectly distinct, and the edges are a little diffuse. There is a black streak along inner margin at base. Basal line lost. T. a. line obscurely indicated by blackish scales in the paler parts of the wing. T. p. line single, obscure, darker brown except toward the inner margin where it is emphasized by black scales; somewhat relieved by following yellow scales, its course as a whole a little outcurved over the cell and only a little incurved toward inner margin. S. t. line a little irregular, broken, made up of yellow scales, preceded and followed by black scale shadings, so that the line is clearly distinguishable throughout its course. A series of distinct blackish terminal lunules. Fringes yellowish. Claviform not marked in the specimen. Orbicular

narrow elongate, oblique, edged by black scales. Reniform narrowly kidney-shaped, upright, somewhat dilated inferiorly, yellowish, more or less black-edged. Secondaries washed with dull yellow, the outer border darker, smoky; fringes pale. Beneath, primaries smoky with a silky lustre; secondaries powdery whitish yellow, with apex and costal margin darker; a punctiform extra-median line and a discal dot.

Expands: 1.44 inches = 36 mm.

Habitat. — Regina, July 28, at light; T. N. Willing.

One male, in fair condition, secured through the kindness of Dr. James Fletcher. The species has the characteristic appearance of members of this genus and is perhaps closer to my *trigona* than any other. The yellowish longitudinal streak and the narrow, yellow ordinary spots are characteristic.

***Perigea flavistriga*, new species.**

Head, pale red-brown, darkening to the vertex. Thorax dark brown, almost blackish, base and tip of collar and margins of patagia more reddish. Primaries dark smoky brown, almost blackish, powdery, so that nothing is defined, though all the usual lines and markings can be made out. Basal line marked by a geminate black spot on costa only. T. a. line incomplete, marked on the costa and by a black outcurve in the submedian interspace, otherwise hardly traceable. The basal space is somewhat yellow mottled and a distinct yellow streak extends beneath the submedian vein by the t. p. line. T. p. line geminate, the outer line obscure, the inner narrow, lunulate, blackish, emphasized by a yellow powdering which follows it, well curved over the cell and very oblique and even to near the middle of hinder margin. S. t. space is a trifle paler to the s. t. line which is irregular, made up of yellow scales, defined by vague black preceding spots and a generally darker terminal space. There is a broken black terminal line. Claviform not traceable in the specimen. Orbicular narrow, oblong, oblique, incompletely margined with yellow scales, a little paler than the ground. Reniform large, kidney-shaped, incompletely ringed with yellowish, which tinges also the middle of the mark itself. Secondaries smoky; paler, more yellowish at the base and with an obscure discal lunule. Beneath, primaries smoky brown, immaculate; secondaries dull, smoky yellowish, with a smoky outer line and discal lunule.

Expands: 1.32 inches = 33 mm.

Habitat. — Lethbridge, Alberta, July 11; T. N. Willing.

A single female in good condition, from Mr. F. H. Wolley Dod (No. 8). It is a robust species with narrow obtusely rounded primaries, the thoracic vestiture flattened hair rather than scales. It belongs with *texana* in general appearance and habitus.

The yellow streak is the most obvious characteristic of this species, which is otherwise powdery and obscurely marked.

***Crambodes abalas*, new species.**

Ground color a powdery, dull reddish luteus. Head with white and metallic gray powderings. Thorax with metallic gray powderings, collar and patagia well defined, posterior tuft well marked. Primaries with all the maculation obscure; costa except apex, fringes and most of the median space smoky brown, not strongly contrasting. T. a. line widely outcurved, most obviously so in the submedian interspace. T. p. line outcurved over the cell, incurved below; both lines indefinite. There is a series of black terminal lunules between which the broad dark fringes are cut with the ground color. Orbicular a vague, indefinite small spot of the ground color. Reniform a similarly indefinite lunule. Secondaries soiled whitish, a little darker toward the outer margin; fringes paler. Beneath soiled whitish, a little smoky on the primaries, powdery, with a smoky longitudinal shading from base to middle of wing.

Expands: .88-1.04 inches = 22-26 mm.

Habitat. — Cochise County, Arizona, in July.

One male and five females, in fair condition only, from Mr. George Franck. The species is smaller than and quite obviously distinct from our northern species and has more the appearance of *Hadenella pergentilis*, as well as its tuftings. It seems safely referable to *Crambodes*, however.

***Orrhodia insinuata*, new species.**

Ground color of head, thorax and primaries dull fuscous brown, overlaid with blackish. Head and thorax immaculate, vestiture loose, somewhat shaggy, thoracic parts not well defined. Primaries with the markings barely traceable and no contrasts of any kind. T. a. line outwardly oblique with moderate outcurves in the interspaces; barely traceable by a slightly darker shading. T. p. line with an even, small outcurve over the cell, and a very slight incurve below; traceable as a very narrow paler line or rather of the ground color free from powderings. S. t. line badly indicated by a slightly paler shading. Orbicular round, of moderate size, with a slightly paler annulus. Reniform, upright, large, a little constricted centrally, slightly darker than the ground. Secondaries a little paler and with thinner scaling than the primaries. Beneath paler than above, with an obscure outer line and on secondaries an obvious discal spot.

Expands: 1.25-1.35 inches = 31-34 mm.

Habitat. — Pullman, Washington, May 8 and 9.

Four examples, all females, in tolerably good condition. The species is congeneric with my *Orrhodia californica* and has the same type of markings so far as any can be distinguished. It is only with a glass, however, and with a knowledge of what is sought that they can be made out at all. The species is more loosely clothed than the typical forms and raises the question whether the generic reference may not have to be changed eventually. The specimens do not have

Professor Piper's label, and are, I believe, a part of a lot received subsequent to his removal from Washington.

***Xylina atincta*, new species.**

Ground color dull ashen gray without any greenish or mossy tinge. Antennæ whitish at base. Collar with a subapical black line, a narrow dark line on patagia basing the wings. Primaries with the upper half of basal space whitish, hardly contrasting, the orbicular white or whitish, nearly always contrasting, the reniform with a faint reddish tinge, a trace of which also occurs before the t. a. line on some specimens. There is a slender black basal streak which curves upward and does not reach much if any beyond the middle of the basal space. Basal line geminate, indicated on the costa only. T. a. line geminate, outer portion a little darker and thicker, as a whole a little oblique and outcurved on the interspaces. T. p. line irregular, well curved over the reniform, abruptly bent in below it; geminate broken, inner line more or less lunulate, outer obscure. S. t. line paler than outer margin, preceded by a variably distinct dusky shade, which tends to become broken into spots. There is a series of distinct interspaceal terminal lunules. Median shade obvious in most specimens, crossing obliquely beyond the middle and outwardly diffuse. Claviform small, concolorous, obscurely outlined, scarcely traceable in some cases. Orbicular of good size, narrow, oblique, a little constricted centrally, narrowly black ringed, usually pale filled so as to be contrasting, but sometimes almost concolorous. Reniform large, broadly kidney-shaped, inner margin a narrow black line, outer border gray; the center is obscurely dark and shaded with a more or less obvious reddish tint. Secondaries smoky with a slight tendency to reddish, the fringes paler. Beneath, primaries dark smoky with costal and outer margin reddish gray and powdery; secondaries reddish gray, powdery, with a distinct smoky extra-median line and a well defined discal spot.

Expands: 1.44-1.58 inches = 36-39 mm.

Habitat. — Cartwright, Manitoba in September.

Three males and six females all from Mr. Geo. J. Keller, of Newark, who received them from a correspondent unknown to me. The species is not represented in the material sent me by Mr. Heath, nor have I had it from any correspondent in that region. I have a specimen from the mountains of western Pennsylvania that seems to belong here and is probably conspecific. The species resembles *tepida* but is not so well marked and lacks the contrasts of that species.

***Cucullia arizona*, new species.**

Ground color dark bluish ash gray, with the maculation smoky and black, sharply defined. Head deep blackish brown, crossed by black and gray lines. Collar gray, with three blackish and two white transverse lines. Dorsum of thorax black powdered; distorted by pressure and therefore not definitely describable. Primaries with maculation intermediate between *convexipennis* and *montana*. From the middle of the costa to the outer margin below the apex a paler gray shade extends, leaving the apical space darker than the rest of the wing and relieving the black scale

dots that indicate the margins of the ordinary spots. Below this pale shading is a dark edging that becomes blackish outwardly. Along the inner border a black shading extends to the middle, then expands and extends through the submedian interspace to the outer margin above the apex, cut by a narrow curved gray line indicating the position of the t. p. line. There is a slender basal black line and around it, extending to the middle of the wing, is the long outward tooth of the t. a. line. Secondaries whitish at base, shading into a broad, almost blackish outer band; veins blackish; fringes white. Beneath, primaries evenly blackish; secondaries much as above.

Expands: 1.80 inches = 45 mm.

Habitat. — Cochise County, Arizona in July.

One female specimen, in good condition except for the compressed thorax due to papering; from Mr. George Franck. The wing form is as in *convexipennis*, and though the color is totally different, that species is at once recalled by the pale shading from costa to the outer margin.

Genus CONOCHARES, new.

Has the habitus of an *Acontia* but with somewhat more pointed primaries. Accessory cell of primaries absent in all specimens examined and the genus is therefore allied to *Thalpochares*. It differs by having the front conically produced, abruptly cut off, and the protuberance with a narrow, elevated rim. The genus therefore bears about the same relation to *Thalpochares* that *Conacontia* does to *Acontia*.

The occurrence of four species with apparently similar structure has persuaded me to propose the above generic term, although the forms already described in allied genera are not well-known and collections are scarce.

All the species are from the desert regions of Arizona and adjacent California; and as in so many forms occurring there, the protuberant front is characteristic, and may be indicative of habit. Two of the species have a superficial resemblance to *Acontia arizonæ* in wing form and type of maculation. The others, while similar, yet resemble the true *Thalpochares* more closely.

Conochares acutus, new species.

Head, thorax and primaries to the middle, white, immaculate. Beyond the wing is gray, more or less white mottled, the white s. t. line obvious, sinuate, the t. p. line more or less obviously marked, curved over cell, and incurved below. There is a series of black terminal marks and the fringes are white. At the inner border of the gray shading, the white base intrudes an acute tooth in the cell, extending to the round, gray, white ringed reniform. Secondaries blackish, fringes white. Beneath, primaries blackish, secondaries white.

Expands: .85-.90 inch = 21-22 mm.

Habitat. — Santa Catalina Mts., April 8-15; southern Arizona, May 15.

Two males from Dr. Barnes, one female from Mr. Poling; one of the males defective, yet representative in maculation. The leaden gray primaries with the acute outward indentation in the cell is characteristic.

***Conochaeres interruptus*, new species.**

Head, thorax and basal half of primaries white, immaculate. Beyond the termination of the white area, at or a little beyond the middle of the wing, the surface is mottled with olivaceous gray, a little tinged with yellowish in some examples. The margin between the white and gray is sharply defined by a blackish gray line which diffuses outwardly, is oblique in general course, and is usually interrupted opposite reniform, the white extending to that spot which is round, gray, and ringed with white. The s. t. space is more or less mottled with gray and white, the pale s. t. line being always well-defined and a little sinuated. Terminal space gray or mottled. A series of small black terminal dots in some specimens. Fringes white, interrupted by a gray shading opposite cell and sometimes by another at hind angle. Secondaries slightly infuscated, darker outwardly. Beneath, primaries dull yellowish to smoky, secondaries white.

Expands: .80-.87 inches = 20-22 mm.

Habitat. — Southern Arizona, April 10, Poling; Phoenix, Arizona, March 12, Griffith; Yuma County, Arizona, in March, Hutson; Argus Mts., California, April, Koebele; Walters Station, California, April, Hutson.

One male and seven females, most of them in rather good condition. Five scattered localities for eight examples, taken by four collectors, argues rather a rare species; but I believe it will be found not uncommon when carefully sought for. As compared with *acutus*, this species is a little smaller, the outer half of wing is distinctly more mottled and with a luteous shading, the dividing line between colors is very even and the fringes are interrupted by gray shadings.

***Acontia dimidata*, new species.**

Head, collar, and anterior portion of thorax gray; remainder of thorax white; abdomen whitish. Primaries white to the middle, where the space is sharply limited by a blackish gray shading which is a little curved and somewhat irregular at the edge. Toward base, the white is irregularly interrupted by gray shadings on the costal region. In the dark portion of the wing there is a mottling of black and whitish scales, and with a lens the maculation can be picked out; but there is nothing clear except a white edging just before the fringes which are based by black scales. Orbicular wanting, reniform barely indicated. Secondaries a little dusky. Beneath whitish.

Expands: .58-.64 inches = 15-16 mm.

Habitat.—Redington, Arizona.

One male and one female from Dr. Barnes; both in good condition. There is nothing just like this species, and its associates are *sedata* and its allies.

***Acontia pima*, new species.**

Head, collar and thorax to the origin of the secondaries, white; behind that bluish or steel gray with metallic reflections. Primaries with costal region white to the s. t. line, upper half of cell white to the reniform, interrupted by a little jog at place for orbicular; beyond the reniform the white continues from the upper border of that spot which is upright, oval, small and marked in outline by black scales. Below the white and in the terminal space the wing is gray, overlaid by olivaceous scales with some iridescent blue and violet intermingled. The violet scales form vague lines, indicating the t. a., t. p. and median lines. The s. t. line is indicated by scattered white and bluish scales to the hind angle, above which a curved white line becomes distinct. There is a series of velvety black terminal marks. The olivaceous gray fringes are cut just above vein 2 by a broad white bar, which reaches to or nearly to vein 4. Secondaries whitish, with a dusky outer border. Beneath, maculation of upper side vaguely duplicated.

Expands: .95-1.00 inch = 24-25 mm.

Habitat.—Babaquivera Mts., Pima County, Arizona.

Two good males from Dr. Barnes, collected by Mr. Poling. The species is allied to *expolita* from the same region; but is larger, whiter, has half the thorax white and the hind angle of the primaries gray.

***Acontia aniluna*, new species.**

Head, thorax and anterior half of thorax white; posterior portion of thorax including tips of patagia shining slate gray. Primaries slate gray with three large white marks on costa, a white mark below the middle of fringes, and a white lunulate mark above anal angle. Of the costal marks that at base is usually trigonate, but may become oblong; the second is near the middle, is oblong and oblique, like a short band, and abruptly ended; the third is within the apex and more or less triangular with rounded tip, in all specimens. The white cut in the fringe may be narrow, may include two interspaces, and may even extend upon the disc of the wing itself. The anal lunule is a part of the s. t. line, and that may be white marked in other parts of its course. The ordinary lines are traceable as smoky lines, the terminal line black, usually punctiform, but sometimes partly continuous. Orbicular wanting, reniform, partly outlined. Secondaries smoky brown, almost blackish, fringes paler. Beneath, primaries blackish, the white blotches of the upper side vaguely yellowish; secondaries whitish, with a broad dark outer border and a more or less obvious blackish median band. Abdomen gray.

Expands: .80-.92 inches = 20-23 mm.

Habitat.—Baboquavaria Mts., Pima County, Arizona, July, 15-30; O. C. Poling; Yuma County, Arizona, Hutson.

Eight examples, mostly in good condition and all females. Two specimens came through Dr. Barnes; the others are from Mr. Poling directly, or from Mr. Hutson. At first sight the specimens resemble *quadriplaga*; but the dark secondaries and the maculation of the fringes negated that reference. I am not so sure now that this is not simply the female of *pima* and that the somewhat imperfect specimen that I have associated with the male type does not belong elsewhere. I have no other example, however, of white secondaries and abdomen in the male as against gray in the female, and no such uniform difference in the costal margin. I prefer to give the name, therefore, to call attention to the matter.

***Acontia alata*, new species.**

Head, collar and thorax laterally white; thoracic disc grayish olive with a white central line or broader mark. Primaries dark, even olive gray, costa white nearly to the apex; a white stripe from base below median vein to about the center of the wing, then curved upward and extending obliquely to the costa within the apex. The entire region above this white stripe is more or less white marked. There is a narrow white terminal line and the tips of the fringes are whitish, secondaries smoky yellowish, the fringes paler. Beneath, primaries even, glistening dark gray, secondaries whitish.

Expands: .65-.70 inches = 15-16 mm.

Habitat. — Baboquivaria Mts., Pima County, Arizona, July 15-30; O. C. Poling.

Three males and one female, all in good condition; one ♂ from Dr. Barnes, whose label reads "Babaquivera," the others from Mr. Poling direct. The species is altogether unlike any other *Acontia* and is more like *Thalpochares* in appearance, if not in structure. The front is cylindrically protuberant.

***Acontia eudryada*, new species.**

Head, thorax and abdomen white. Primaries white to the outer third at inner margin, and from that point a gray and olivaceous shade extends with an outcurve to the apex, narrowing so as to include only the s. t. space, leaving the terminal space white until just before the apex is reached. At base there is a slate gray costal shade to show the inception of a t. a. line. At middle there is a small trigonate cloud. The outer shading has a golden yellow tinge at the inner edge, and an angulated metallic blue line which extends as a powdering to the apex. Secondaries blackish, paler at base; fringe whitish. Beneath, primaries black clouded; secondaries whitish.

Expands: 1.05 inches = 26 mm.

Habitat. — Southern Arizona, August 15-30, Mr. O. C. Poling.

One female specimen, almost perfect. Is allied to *cretata* but larger, with a much narrower outer band and blackish secondaries. It is to my mind the handsomest species in this attractive genus.

***Acontia cuta*, new species.**

Head, thorax and abdomen white, the latter with a creamy tinge. Primaries white to the middle, beyond which it is gray except for a lunate mark on the costa. This lunate mark is separated from the white base by an inwardly oblique band of gray, and does not extend to the apex. A white patch in the fringes of outer margin at about the middle. The orbicular is round, of moderate size, concolorous, narrowly brown ringed. Secondaries whitish. Beneath, primaries yellowish, with maculation of upper surface showing faintly. Secondaries whitish.

Expands: .75 inch = 19 mm.

Habitat.—Santa Rita Mts., Pima County, Arizona, Dr. Barnes; Baboquivaria Mts., July 15-30, O. C. Poling.

Three female specimens in fair condition. A very simply marked form of the *elegantula* type.

A NEW ONCOCNEMIS FROM NEVADA.

By HARRISON G. DYAR, PH.D.,

WASHINGTON, D. C.

***Oncocnemis bakeri*, new species.**

Head brown, collar gray, nearly white at tip; thorax dark gray, abdomen lighter. Forewings gray, powdery, hoary, smoother and brownish terminally. Basal line black, small, slender; t.-a. and t.-p. lines single, black, the t.-a. line slightly arcuate, a little widened on costa, t.-p. line strongly excurved over cell, else nearly regular. Subterminal line lost; orbicular and reniform concolorous, in a scarcely perceptible brownish tint, finely black-ringed and narrowly whitish within this edging; claviform indicated. Hind wing translucent white, smoky tinged on veins outwardly and on extreme margin. Below pale, forewing with a black dash representing the inception of the t.-p. line on the costa. Expanse 28-32 mm.

One ♂ and one ♀, Ormsby County, Nevada (C. F. Baker).

Type.—No. 7,777, U. S. National Museum.

It resembles *figurata* Harvey and *simplicia* Smith (the latter is not before me).

Class I, HEXAPODA.

ORDER XI, ORTHOPTERA.

A NEW BACUNCULUS FROM INDIANA.

BY A. N. CAUDELL,

WASHINGTON, D. C.

Bacunculus blatchleyi, new species.

Body moderately slender, noticeably heavier than that of *B. tenuescens*. Head smooth, subquadrate, in neither sex so strongly swollen anteriorly as in *B. tenuescens* and no more than twice as long as broad; attached subhorizontally to the pronotum. Pronotum about one fifth as long as the mesonotum, which is a little longer than the metanotum, the moderately distinct intermediary segment included. Abdomen of the male scarcely inflated apically, the seventh and eighth segments subequal in length, each a little shorter than the ninth. Supra-anal plate small, triangular. Cerci of female rounded and as long as the terminal segment of the abdomen, being about seven or eight times as long as the basal width, straight and quite uniformly tapering; cerci of male cylindrical, scarcely at all tapering, curved downward and inwards crossing each other as usual in both *Diapheromera* and *Bacunculus*; armed on the inner side at the base with a distinct but blunt projection, or spine. Operculum of male as in *tenuescens* but slightly more massive. Legs heavier and less attenuate than in *tenuescens*, the middle femora of the male distinctly heavier and thicker than the posterior ones and armed below near the apex with a stout, blunt curved spine; middle femora of the female with a small spine near the apex below, otherwise the legs of both sexes are unarmed.

Color probably brown to green, or yellowish green. The specimens before me were preserved in spirits and the colors are probably considerably changed.

Length, head, male, 3 mm., female, 4 mm.; pronotum, male, 2.5 mm., female, 3.25 mm.; mesonotum, male, 13 mm., female, 16 mm.; metanotum, male, 12 mm., female, 12 mm.; fore femora, male, 2 mm., female, 16 mm.; middle femora, male, 15 mm., female, 13 mm.; hind femora, male, 20 mm., female, 18 mm.; cerci, female, 3.75 mm.

One male, one female, Starke Co., Indiana (Blatchley).

Type No. 9099 U. S. Nat. Museum.

The females of this species are scarcely separable from those of *Diapheromera veliei* when unassociated with the opposite sex.

JOURNAL

OF THE

New York Entomological Society.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

EDITORIAL.

The following contribution to the discussion of the subject of generic types has been sent to us by Mr. Louis B. Prout, of London, England, and refers to the discussion in the June, 1904, number of this Journal:

"Permit me to suggest that if the editor's views and those of Prof. J. B. Smith, as there set forth, be combined, with the elimination of all elements of personal preference, etc. (which you will agree with me, are the causes of instability and of discord), we shall have an almost perfect system, and one that—as it would work well-nigh automatically—we should all do well to adopt. Evidently adherence to an original spelling would be undoubtedly 'automatic'; I rejoice to see that you very nearly advocate this, and if I read you aright you are not even *hopelessly* antagonistic to the non-Latin 'w' in dedicatory names. Why should *Walkeria* or *Walsinghamia* be disguised by an initial U or V? Surely we in England must not advocate such a proceeding, when our national coinage is perpetuating the barbarous 'Edwardus'! As to the 'k,' you are of course right, and Sir George Hampson's change to 'c' indefensible. Better reject dedicatory names *in toto* than mutilate them beyond recognition.

"The inconsistency of demanding *verbal* definition you have admirably exposed, as also previously in Trans. Am. ent. soc., xxiv, 6. Rothschild and Jordan have made a pretty business of it in

their otherwise masterly 'Revision of the Sphingidæ.' They first reject all genera that are not diagnosed; next they reject all diagnoses prior to their own (*e. g.*, citing as 'type' a species which absolutely contradicts the old diagnosis); why are they not logical enough to end by rejecting all generic *names* 'prior to their own'?

"This brings me to the last, and most important point, the defence, by certain lepidopterists, of the illegal practice of making the first species of a genus the 'type,' irrespective of historical action. I know of no code which permits such a course, and am at a loss to know what right we lepidopterists have to be 'a law unto ourselves' in so vital a matter; the general zoological rules must be our guide. Of course, if we are willing to trample on diagnoses and on common sense, and to make *prasinana* the type of *Tortrix* and so on, the method will be automatic, and therefore in a sense useful; but if we apply it reasonably—as even Sir George Hampson advocates—it is no more automatic than the legal method, properly understood and applied. Perhaps you have overlooked the fact that the different results arrived at by different workers professing to follow the 'elimination' method are mainly due to their having tried to follow the indefensible and impossible applications of it which have unfortunately stultified the results in Scudder's otherwise magnificent 'Historical sketch'; *i. e.*, they have allowed one name, independently erected, to 'restrict' another—whereof the second author had probably never even heard!—have forbidden an author or reviser to fix as type of one genus a species which has earlier been made (or which even now becomes, on their arbitrary methods) the type of another, and have brought in other extraneous elements which have resulted, as Sir George Hampson has so well said, in a 'reductio ad absurdum.' If the history of each name were traced independently and types fixed in accordance, the matter would be greatly simplified. Compare Walsingham and Durrant's 'Merton Rules,' No. 44: 'He who first restricts a genus under its own name limits the possible type,' etc. There is nothing 'absurd' in this, quite the reverse; for it recognizes and respects an intention to revise antecedent work, and fulfils the requirements of the 'British Association' and other codes. Theoretically, no author ought to revise nomenclature without knowing his literature (of course mere faunistic lists can be ignored as they have no restrictive influence); but even if, as you suggest, some reference were overlooked by the monographer, it would not dislocate an entire

cantation of names, as on the Scudder system; but, at the worst, only the one, or ones, immediately involved. A moment's thought will show that, given the literature of a certain name, the type can be decided as automatically, and almost as quickly as, and certainly far more logically than, by the arbitrary selection of the first species — a method which I cannot agree with you is at all likely to obtain in the long run, in face of the strong arguments which were adduced against it by nearly all the authorities who took part in the Sir George Hampson Nomenclature Correspondence (Proc. Internat. Congr. Zool., App. A, Cambridge, 1898) and of the fact that in this matter we ought to work harmoniously with other zoölogists, who can hardly be expected to consent to a course which would bring about such disastrous results in their particular departments."

LOUIS B. PROUT.

LONDON, N. E., 18 Nov., 1904.

Our correspondent advocates what Rothschild and Jordan call the "First method of restriction," or the method of nomination of types.* We admit that we have not seen this method fairly tried, though we had thought the same objections applicable to it as to the other "historical method," the second method of restriction of Rothschild and Jordan, or the method of residues. These methods are sometimes thought to be similar or parts of one method, but, as Rothschild and Jordan say: "As the first and second methods are opposed to one another, differing nearly always in the results attained, we reject them both." Of course it does not necessarily follow that a method should be rejected because opposed to another; that might prove it the right one. But we are pleased to see that Mr. Prout condemns the method of residues. This is the method heretofore used by Lepidopterists from Scudder to Kirby. It must be abandoned. What method shall we substitute? Mr. Prout urges conformity with other zoölogists; but we have yet to see a code of rules that clearly covers the points of the present subject.

* Called by Kirkaldy "The historical method" and advocated by him. (Proc. ent. soc. Wash., vii, 1905.)

BOOK NOTICES.

An Outline of the Theory of Organic Evolution, with a description of some of the phenomena which it explains. By MAYNARD M. METCALF, Ph.D., Professor of Biology in the Woman's College of Baltimore. New York, The Macmillan Company, 1904.

Professor Metcalf presents his subject in a compact and readable style with numerous illustrations. Several color plates of moths, butterflies and spiders give a good idea of the "mimicry" which is so well shown by these insects. The book has resulted from a course of lectures and is therefore well adapted for students.

American Insects. By VERNON L. KELLOGG, Professor of Entomology and Lecturer on Bionomics in Leland Stanford Jr. University, with many original illustrations by MARY WELLMAN. New York, Henry Holt and Company, 1905.

This bulky volume of 674 pages gives a general outline of all American insects and deals more largely with anatomy than is usually the case with books of this class. The classification is after Comstock and the synoptic tables are largely remodeled after his. The work is adapted only for beginners or general students (if there are any such) and does not lead to specific determinations. It is almost up to date, including a chapter on mosquitoes and disease. It ends with an account of collecting and rearing insects, which one would fancy must be a laborious undertaking from the amount of apparatus illustrated. Jelly tumblers have always served for us.

Wilhelm Junk Entomologen-Adressbuch. Preis Mark 5. W. JUNK, Verlag für Entomologie. Berlin, 1905, NW., Rathenower Strasse 22.

Another entomological address book is before us, well printed and in convenient, compact form. We notice some names not in other similar works which is commendable. There are also some curious errors. For instance, Mr. Geo. Franck, whose name will be found in our list of members published with the June issue of this Journal, appears under the pseudonym of "Iranck," both in text and index. It would be an advantage if publishers of address books could combine on one really good book instead of scattering their efforts as at present.

The Naturalist's Universal Directory, containing names, addresses and special subjects of study of professional and amateur naturalists in all parts of the world. 19th edition, compiled in 1904. Salem, Mass., U. S. A., Samuel Edson Cassino, 1905.

With every edition this work becomes bulkier and of less service to naturalists. We note the omission of the names of entomologists (our own, for instance) and the inclusion of those of collectors of stamps and coins. While not objecting to these, at least harmless pursuits, we fail to see the propriety of including them as "naturalists." Certainly the directory does not need them; there are enough names. But why all these separate directories? We shall need a directory of directories shortly.

A Synonymic Catalogue of the North American Rhopalocera. Supplement No. 1. By HENRY SKINNER, M.D. Philadelphia. Complete to end of 1904. [Received Sept. 14, 1905.]

Dr. Skinner has given us a very useful little supplement to his catalogue of butterflies. It is somewhat bristling with typographical errors and blunders, but we are used to that sort of thing from Philadelphia. There are some comments, indicating new synonymy and one new name (varietal) is proposed. The number of species added to our list is not large. The generic names have not been brought up to date, the author expressly stating that he is "not interested" in the subject, which he is pleased to designate as "generic fantasies." This is, we think, a fault. It is easy to stigmatize what one will not take the trouble to understand; but a good opportunity of correcting the antiquated nomenclature of the North American butterflies has here been lost.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF DECEMBER 6, 1904 (continued from page 168).

Mr. Bueno said further that in the works on American Entomology to which he had access, the family Gelastocoridæ Kirk. (Galgulidæ) was given as being represented by only three species in the United States. He has, however, a list of nine species, in four genera, as follows: *Pelagonus americanus* Uhler, *Gelastocoris oculatus* Fabr., *G. variegatus*, *G. vicinus* Mont. and *G. n. sp.?* from Florida, *Mononyx nepesiformis* Fab., *M. fuscipes* Guér. and *M. n. sp.?* also from Florida, *Nerthra stygica* Say.

MEETING OF DECEMBER 20, 1904.

Held at the American Museum of Natural History. President C. H. Roberts presided with thirteen members present.

The librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

- Verhandl. k. k. zool. bot. Gesells., Vol. LIII, No. 10; Vol. LIV, Nos. 1, 2, 3, 4, 5, 6 and 7.
- Ohio Naturalist, Vol. IV, Nos. 4, 5, 6, 7 and 8.
- Tijdschrift voor Entomologie, 1904, No. 1.
- Entomologische Meddelser, 1903, 1904, No. 1, 5 and 6.
- Proc. Amer. Acad. of Arts and Sciences, Vol. XXXIX, Nos. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24; Vol. XL, Nos. 1, 2, 3, 4, 5, 6, 7, 8 and 9.
- Bull. Univ. Montana, No. 8, Biol. Series, No. 6.
- Bull. Univ. Montana, Nos. 20 and 23.
- Bull. Univ. Texas, Nos. 33 and 34.
- Philos. Soc. Washington, Vol. XIV, pp. 247-276.
- Bulletino della Soc. Ent. Italiana, XXXV-I and II, III and IV.
- Cincinnati Museum Association, 23 Ann. report.
- Proc. Amer. Phil. Soc., XLII, No. 174; XLIII, No. 176.
- Trans. Canad. Institute, II, p. 3.
- Deutsche Ent. Zeitschrift, 1904, Heft 1 and 2.
- Fourteenth Jahres-Bericht d. Wiener Ent. Vereines., 1903.
- Stettiner Ent. Zeitung., 65 Jahrgang, Heft 1 and 2.
- Proc. U. S. Nat. Mus., Nos. 1371, 1375, 1376, 1378, 1382, 1387, and 1389.
- Canadian Entom., XXXVI, Nos. 4, 5, 6, 7, 9, 10, 11.
- No. Carolina, Dept. of Agric. Div. of Ent. — The San Jose scale by Franklin Sherman.
- Jahresbericht des Naturwissenschaftlichen Vereins des Trencséner comitates for 1902 and 1903.
- Bull. Soc. imperiale des Naturalists de Moscow, 1904, No. 1; 1903, Nos. 2 and 3.
- Zeitschrift f. Entomologie; Breslau, 1904, Heft 29.
- Allgemeine Zeitschrift f. Entomologie, Vol. VIII, Nos. 16-24; Vol. IX, Nos. 1-20.
- Researches on N. Amer. Acrididae by A. P. Morse, Carnegie Instit., Washington, D. C., 1904.
- Wiener Ent. Zeit., XXIII, Nos. 2, 3, 4, 5, 6.
- Journal of Dept. Agric. of Victoria, Australia, Vol. II, Pts. 3, 4, 5, 6 and 7.
- Bull. Agric. Victoria, Australia, Nos. 7 and 12.
- Annales del Mus. Nac. de Buenos Aires, Ser. III, Tome II and III.
- Ann. Soc. Ent. Belgique, XLVII, 1903.
- Trans. Texas Acad. Sciences, V, 1902.
- Mr. Leng, of the publication committee, read a letter from Dr. Dyar which constituted the report of the committee.
- Dr. Love stated that as it did not seem advisable to hold a banquet this year he would desire that the committee be discharged, and made a motion to that effect* which was carried.

The President appointed as a committee to nominate officers to be ballotted upon at the next meeting, Messrs. Love, Southwick and Watson.

Mr. Weeks advocated the printing in each issue of the JOURNAL a list of the members of the New York and Brooklyn societies and read a communication which he had received from Dr. Dyar in reference to the matter.

On motion of Mr. Leng the matter was referred to a committee to investigate the cost of printing such a list and to endeavor, if they saw fit, to raise the funds by subscription.

Messrs. Leng, Weeks and Joutel were appointed on this committee.

Mr. Groth stated that he desired taken from the table a former tabled motion of his, that the Journal be furnished free to active members in good standing.

The discussion was participated in by nearly all of those in attendance, and upon vote the motion was lost.

Mr. Leng spoke of the species of *Cychnus* inhabiting the eastern United States. After briefly describing the habits of this genus of Carabidæ as living under logs and stones and feeding on snails, and the striking characteristics of the species, their large size, brilliant color, unusual development of the palpi and mouth parts; he mentioned the special interest recently awakened in these insects by the collections made in the mountains of North Carolina by Beutenmüller, Beyer, Schaeffer and Van Dyke; and in Newfoundland by Genung, in West Virginia by Dr. Love and himself; in Missouri by Mr. Barber, and in the southwest by Prof. Snow; in the District of Columbia by Mr. Schumacker, and on Manhattan Island by Messrs. Davis and Joutel. The point to which Mr. Leng drew special attention was the meaning of certain names now lost in synonymy which should be revived before more names are added. Twenty-seven names have so far been proposed, of which fourteen appear in the check-list and two have been proposed since the check-list was printed; leaving eleven at present in synonymy. Some of these eleven were indicated as geographical races in the collection shown by Mr. Leng, notably the following:

C. flummeus Hald. which is the broader form of *elevatus* occurring in Missouri.

C. leonardi Harris which is the smaller form of *viduus* occurring in the mountainous regions of New Hampshire and New York.

C. niagarensis which is probably the correct name to apply to those specimens from the middle states commonly called *lecontei*.

All of the names remaining in synonymy should be critically examined and accurately placed.

Messrs. Schaeffer, Joutel and other members took part in the discussion that followed. Mr. Joutel pointed out the character he had observed in all specimens of *unicolor* Oliv., viz.: a sinuation of the elytral margin about the posterior third. The synonymy of *unicolor* and *heros* was also brought out, *unicolor* being the older name. Mr. Schaeffer spoke of *bicarinatus* as found in the Black Mts. and the differences between such specimens and the type from Habersham Co., Ga. Mr. Leng, in reply to a question, expressed the opinion that all our eastern species are reducible to three original species from which the existing forms have been evolved by the influence of isolation as indicated by Newman's division into three subgenera, *Spharoderus*, *Scaphinotus* and *Irichroa*.

Mr. Southwick on the subject of "Notes on Local Bythoscopidæ and Cercopidæ"

exhibited many of the eastern species of these two families, gave a list and commented on a number of species especially those of economic importance.

MEETING OF JANUARY 3, 1905.

Held at the American Museum of Natural History. President C. H. Roberts in the chair and ten members present.

The treasurer, Mr. Davis, made his annual report showing that the society had a balance of \$599.04, the Journal fund, \$235.66. Total balance January 1, 1905 was \$834.70.

Dr. Dyar of the publication committee gave a report in which as editor of the Journal he offered several suggestions in reference to conducting the current volume in order to cut down the expense.

Mr. Watson read the nominations of officers for the ensuing year as follows :

President — C. H. Roberts.

Vice-President — C. W. Leng.

Recording and Corresponding Secretary — H. G. Barber.

Treasurer — Wm. T. Davis.

Librarian — C. Schaeffer.

Executive Committee — E. B. Southwick, L. H. Joutel, F. E. Watson, G. Beyer, C. F. Groth.

Publication Committee — H. G. Dyar, C. W. Leng, C. Schaeffer, C. T. Brues.

On motion of Mr. Kearfott the secretary cast one ballot for the entire ticket as nominated.

On motion of Mr. Weeks the society voted to discontinue sending postal card notices of future society meetings.

Mr. Roberts exhibited a collection representing the genus *Dytiscus* and made some remarks on the different species.

MEETING OF JANUARY 17, 1905.

Held at the American Museum of Natural History. President C. H. Roberts presided with nine members present.

The auditing committee reported that the accounts of the treasurer had been examined and certified as correct.

On motion, Mr. R. L. Ditmars and A. H. Weeks were dropped from membership for non-payment of dues.

The secretary read a communication from Mr. J. R. de la Torre Bueno requesting a grant from the Hermann fund to carry on an investigation of the Cryptocerate Hemiptera. The matter was referred to the executive committee.

Mr. Davis exhibited several specimens of *Gordius* worms parasitic in the bodies of various insects. One of these had been taken from the body of a caterpillar (*Hemileuca maia*). The other, 28 inches in length, came from a body of *Dytiscus* beetle.

Mr. Barber exhibited a collection of Hemiptera consisting of the families Coreidae, Pyrrhocoridae, and Lygaeidae, collected by Mr. Schaeffer at Brownsville, Texas and gave some notes on the geographical range of these.

Mr. Schaeffer showed some of the rarer Coccinellidae.

The members discussed at some length *Ignotus enigmaticus* Slosson.

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ERRATA ET ADDENDA.

Page 145, lines 8 and 25, for "*shooteri*" read *shooterii*.

Page 151, last line, add Type No. 8327, U. S. National Museum.

Page 152, line 20, for "Rhynchographieen," etc., read Rhynchotographieen
 Abh. Vöhm. Ges. Wiss. (5), vol. vii, p. 479.

Page 155, line 35, for "Maxicuche" read Maxincuche.

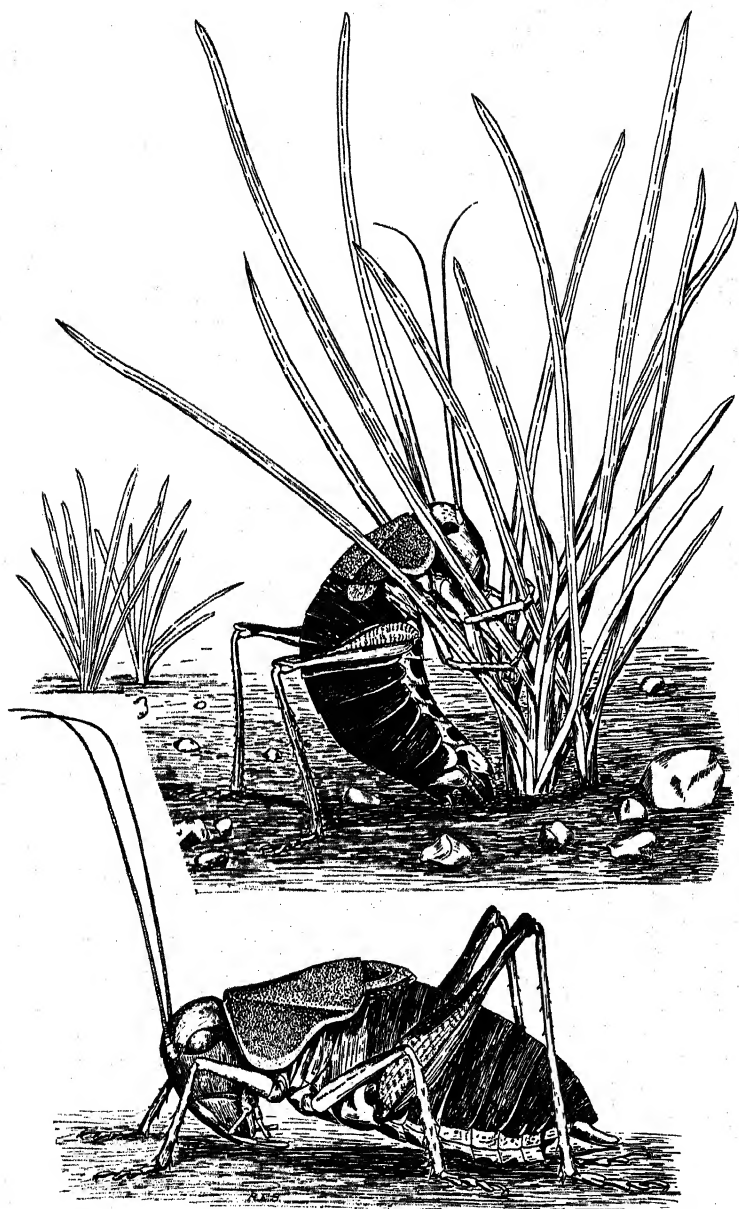
Page 158, line 28, *dele* "Fort Collins, Colorado."

Page 159, line 15, add "Ms."

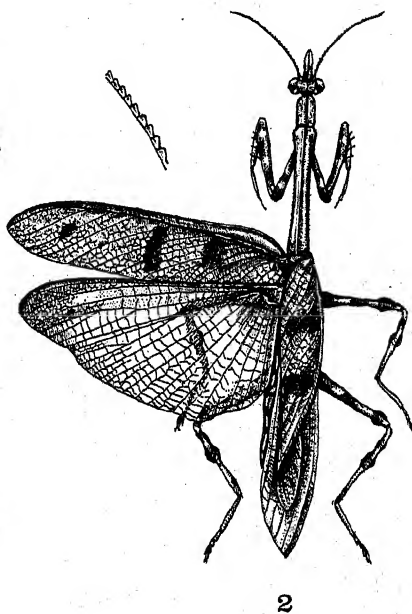
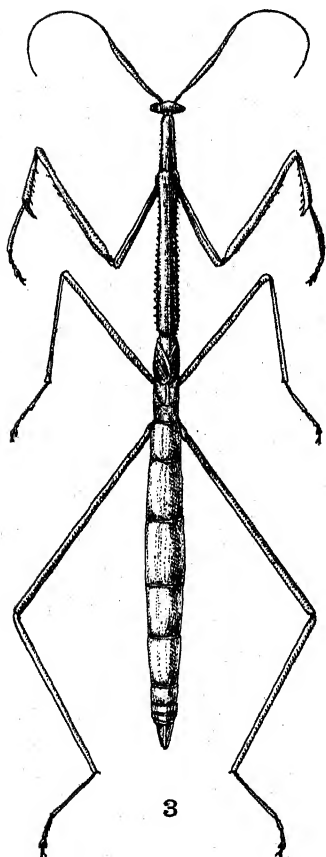
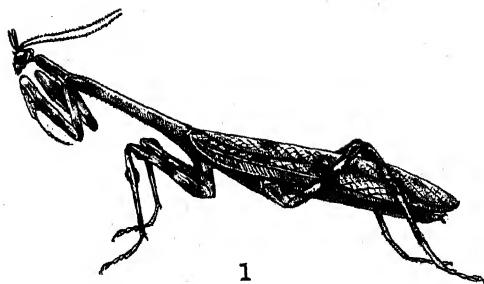
Page 160, line 22, for "Lieb." read Fieb.



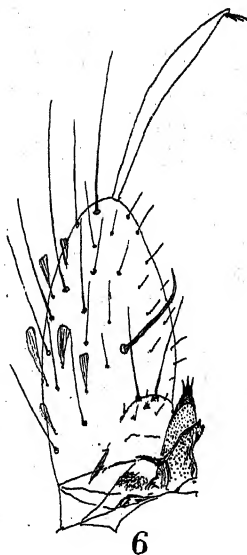
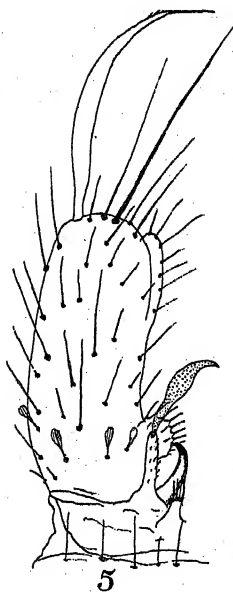
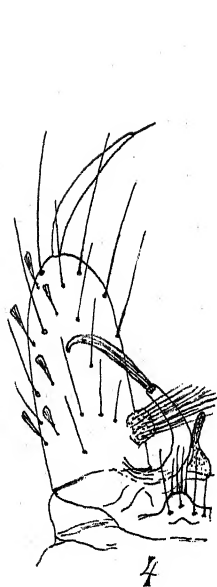
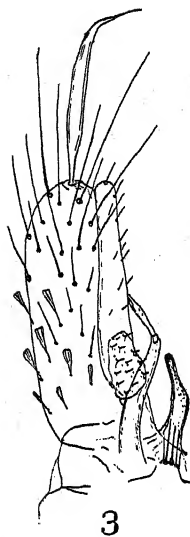
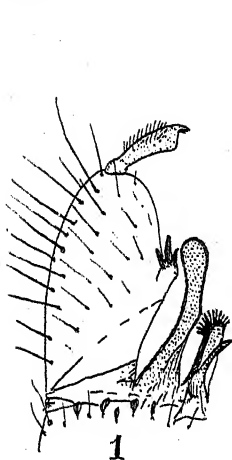
The Coulee Cricket.



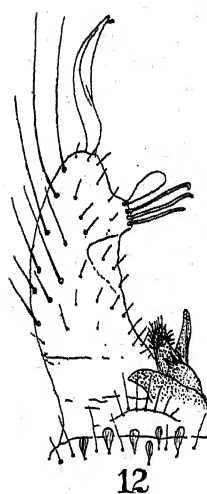
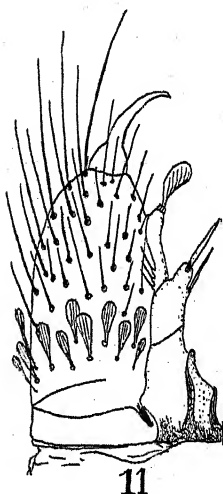
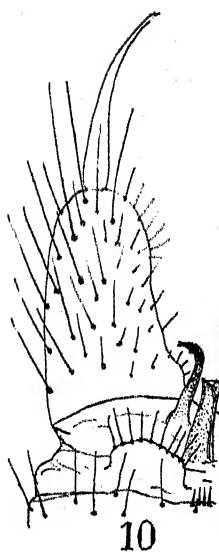
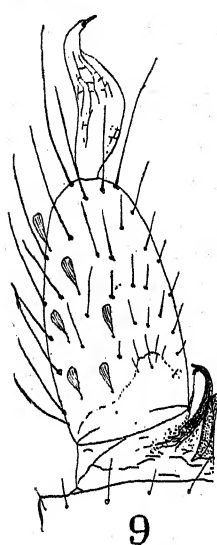
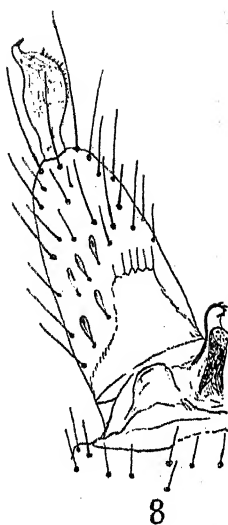
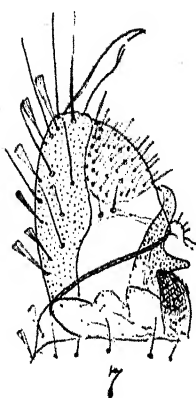
The Coulee Cricket.



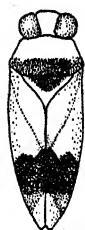
United States Mantids.



Genitalia of Mosquitoes.



Genitalia of Mosquitoes.



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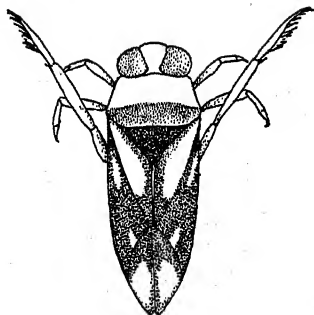
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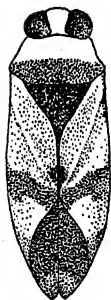
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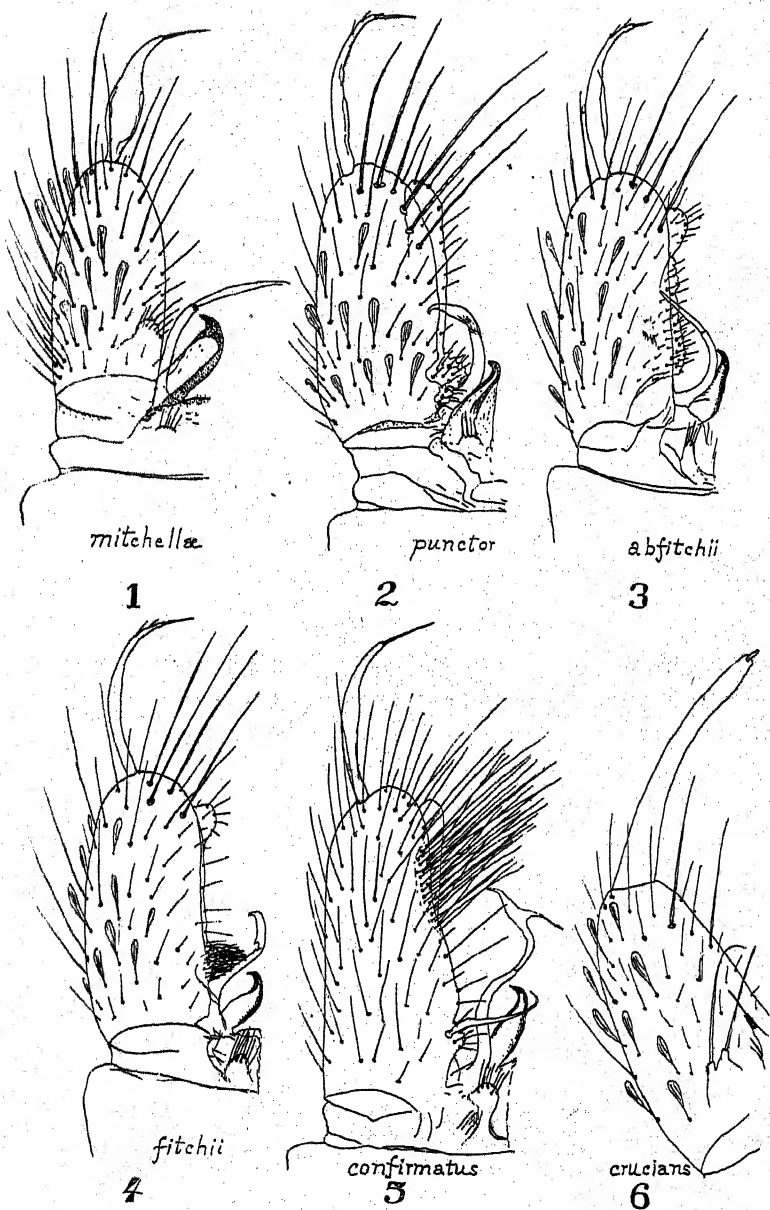
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9

E. L. Beutenmüller.

Notonecta of North America.



Genitalia of Mosquitoes.

JOURNAL
OF THE
NEW YORK
ENTOMOLOGICAL SOCIETY

Devoted to Entomology in General

Volume XIV, 1906

EDITED BY HARRISON G. DYAR

NEW YORK
PUBLISHED BY THE SOCIETY
QUARTERLY
1906

PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

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JOURNAL

OF THE

New York Entomological Society.

Vol. XIV.

MARCH, 1906.

No. 1

Class I, HEXAPODA.

Order II, COLEOPTERA.

NOTES ON SOME SPECIES OF THE GENUS ANOMALA WITH DESCRIPTIONS OF NEW SPECIES.

BY CHARLES SCHAEFFER,

BROOKLYN, N. Y.

I have a short revision of this genus nearly ready for publication, but awaiting some Mexican material for comparison and confirmation of my identifications. The following notes are published in advance.

Anomala antennata, new species.

Larger than *parvula* Burm., which it otherwise resembles in form, thorax with similar two dark spots at apex, but the elytral intervals are of equal size, convex. Antennal club slightly longer than the rest of the joints, pale testaceous. Head black coarsely rugosely punctured in front, more fine and sparse on the occiput, clypeal margin widely reflexed, broadly arcuate in front; eyes moderately prominent. Thorax more than twice as wide as long, sides arcuate, hind angles rounded, front angles obtuse; base finely margined; disk convex, surface rather sparsely and shallowly, punctate; color testaceous with two slightly elongate dark apical spots each oblique behind. Elytra slightly broader at base than the thorax, sides nearly parallel, disk convex, surface with nine striae, the latter not punctate, intervals nearly equal, convex, except the subsutural which is broader and somewhat coarsely punctate at basal half, punctures finer and more distinct behind middle, the other intervals scarcely punctate and uneven; color testaceous with suture and side margin slightly darker. Pygidium moderately coarsely punctate, denser at sides than at middle. Body beneath and legs testaceous; metasternum clothed not densely with long hairs; abdomen shining, scarcely punctate and with only a few hairs. Front tibiae bidentate, the larger front claw finely cleft, the upper portion very short and hardly visible, intermediate claws entire, not cleft. Length (head porrected), 10 mm.

New Mexico, one male in collection Dietz.

The formation of the male claws brings this species near *parvula* which it otherwise resembles in color, thoracic markings and form, but is larger, has a deeply excavated clypeus and the elytral intervals are different.

Anomala flavilla Bates.

Biol. Cent. Am., vol. II, pt. 2, p. 226, tab. XII, fig. 18.

Several specimens of this Mexican species, collected in Ehrenberg, Arizona were received from Mr. George Franck.

It is slightly more elongate than *flavipennis* Burm., the color is testaceous, with two apical thoracic spots and suture black; the alternate elytral intervals broader, not convex, the subsutural coarsely and irregularly punctate, the others more sparse and finer; the two apical thoracic dark spots extend from apex to middle, broader at the latter point and narrowing to apex; the front tibiae are tridentate and the outer claws of the front and middle tibiae are cleft. Dr. Ohaus records also dark-colored specimens from Mexico, but all those from Arizona are pale.

Anomala centralis Leconte.

New species N. Am. Col., 1863, p. 78.

Through the kindness of Mr. G. Beyer I received some typical specimens of this species, collected by him in Lower California. The Arizona specimens referred to this species by Dr. Horn and standing in most collections as that species, are a different thing and in my opinion only an extreme variation of *inconstans* Burm. (*lurida* of our list); *centralis* is on the average smaller and slightly more parallel, with the hind tibiae relatively shorter and broader. Of *inconstans* I have taken this year quite a number of specimens, but more of the pale than of the darker form.

Anomala innuba Fabricius.

Mant. Ins. I, p. 22.

This is the species called in all of our collections *minuta* Fab. The correction of this error is due to Dr. Fr. Ohaus, who has seen the type. The true *minuta* will be referred to later.

Anomala polychalca Bates.

Biol. Cent. Am., vol. II, pt. 2, p. 236.

I refer a few specimens taken at light near Brownsville, Texas, to this species or rather variety of *cincta* Say.

Above, below and legs more or less metallic green, thorax in one specimen with a slight coppery tinge, striæ of elytra impressed and distinctly punctate, intervals nearly equal, convex, finely punctate; pygidium coarsely and in some parts confluent punctate; clypeus rounded and moderately reflexed; mesosternum broader between the coxæ than in *binotata* Gyll., which it resembles in form, but is slightly larger. One specimen shows on the elytra a few dark testaceous streaks.

***Anomala luteipennis* Leconte.**

Proc. Acad. Nat. Sc. Phil., vol. VII, p. 80.

This name is wrongly applied by Dr. Horn and others to the pale specimens of *binotata* Gyll. from Texas and Arizona. Dr. Leconte describes the pygidium as being "parcius sat grosse punctatus," which is in *binotata* invariably finely rugose. Some of the pale forms of an *Anomala* which I took near Brownsville, Texas, agree in every respect with Dr. Leconte's description, also nearly with the locality; these are connected by intermediate specimens from Virginia and Texas with *flavipennis* Burm.

***Anomala peninsularis*, new species.**

Form of *binotata* Gyll., shining, testaceous, head, thorax, suture, margin and sides at base of elytra, as also the legs, reddish. Head coarsely and densely punctate, clypeus transverse, apex subtruncate, angles rounded, margin moderately reflexed, clypeal suture distinct. Thorax shining, sparsely punctate, convex, sides slightly arcuate, hind angles rounded, front angles not prominent. Scutellum coarsely punctate. Elytra widening towards apex, intervals clearly defined and alternately wider, the wider intervals flat, irregularly punctate, the costæ (narrow intervals) slightly convex and almost impunctate. Metasternum clothed with moderate, long hairs, abdomen shining and sparsely punctate; pygidium transverse, subconfluent punctate, the punctures not deeply impressed. Front tibiæ bidentate, the apical tooth elongate and slightly curved, the upper tooth prominent but obtuse, the larger tarsal claw cleft at tip, the upper portion finer and shorter than the lower in the male, equal in the female; outer claw of middle tarsi cleft, the upper portion nearly as long as the lower, but narrower. Length, 11 mm.; width 7 mm., male. Length, 13 mm., width 7 mm., female.

Santa Rosa, Lower California, male and female, collected by Mr. Gustav Beyer, to whom I am greatly indebted for this as well as other interesting species.

***Anomala ludoviciana*, new species.**

Form of *binotata* Gyll. but smaller, thorax and elytra more coarsely punctured, head, thorax and legs dark rufous, the thorax with slight metallic luster and elytra with or without darker spots. Head coarsely punctate in front, more finer and

sparser on the occiput, clypeus subtruncate in front, angles rounded, margin moderately reflexed, clypeal suture distinct. Thorax transverse, narrowing to the front from a little before middle, nearly straight behind, basal angles rounded, front angles prominent, surface relatively coarsely punctate, but not densely. Scutellum coarsely punctate. Elytra slightly broadening towards apex, punctate striate, the punctures dark and here and there confluent, intervals flat, alternately wider, the subsutural coarsely and irregularly punctate, the others with an irregular row of punctures, the costæ (smaller intervals) slightly convex and not punctate, the disk more or less transversely rugose. Pygidium finely rugose as in *binotata*. Metasternum sparsely clothed with not very long hairs; abdomen sparsely punctate with moderately coarse but not deeply impressed punctures. Front tibiæ bidentate, the larger claw cleft at tip, the upper portion shorter and much narrower than the lower; intermediate claw cleft with the upper portion finer than the lower, but nearly as long. Length 9.50 mm.; width 5.25 mm.

Vowell's Mill, Louisiana, Mr. Charles W. Leng, to whom I am indebted for the specimens.

This species is closely related to *binotata* Gyll. but differs from that by being smaller, the prothorax and elytra more coarsely punctate, and the upper portion of the cleft claw being much finer and shorter. With this species I place at present some specimens from Kansas received from Prof. Snow as *binotata* var., which have the head, thorax, scutellum and legs dark-green, but which otherwise agree with the Louisiana specimens. Similar variations are seen in *flavipennis* Burm.

Anomala carinifrons Bates.

Biol. Cent. Am., vol. II, pt. 2, p. 249, tab. XIII, fig. 24.

This species is mentioned by Bates to occur in our fauna from a specimen collected by Morrison in Southern Arizona. I have two specimens from Arizona which answer the description, one of them was collected by my brother in Bisbee. It is larger and more robust than *cavifrons* Lec., the striæ are faintly but distinctly punctured, the head and thorax also distinctly punctured and the surface is shining, while it is semiopaque in *cavifrons* Lec.

Anomala minuta Burmeister.

Handb., vol. IV, 1, p. 249, and IV, 2, p. 504.

In the remarks following the description of *semilivida* Lec., Dr. Horn* mentioned some darker specimens, which are the true *minuta* Burm. Dr. Ohaus' good description† of the type saved me from making a synonym, as I had these specimens already labelled with a

*Trans. Am. Ent. Soc., XI, p. 162.

†Stett. ent. Zeit., lxiii, p. 48.

manuscript name. In the three specimens before me, which are from Florida, the thorax is dark-brown on the disk with the side margins and apex more or less pale, the elytra dark testaceous, with suture and sides more or less brown; the front and middle tarsal claws are simple, the first interval is relatively coarsely and irregularly punctate and the clypeus is not as concave as in *semilivida* Lec.

***Anomala tibialis*, new species.**

Larger, more robust and convex than *parvula* Burm., with more parallel elytra and hind tibiae very short and triangularly dilated at apex. Head piceous, front paler, clypeus dark testaceous, coarsely and closely punctate; clypeus transverse, broadly rounded in front and narrowly reflexed. Antennae moderate, club slightly shorter than the preceding five joints. Thorax more than twice as wide as long, sides narrowing to the front from before middle, nearly straight behind, hind angles rounded, front angles not prominent; disk convex, apical marginal bead nearly obsolete at middle, basal marginal bead distinct, surface testaceous with two oblique dark, elongate markings at apex on each side of median line, the markings irregular in outline and slightly curved outward, sparsely not coarsely punctate, the punctures at sides and towards base nearly obsolete. Elytra elongate, parallel, testaceous, suture and margin dark, surface sculpture and striae more or less obscured by transverse rugae, the striae at sides more distinct and coarsely punctate. Under side testaceous, shining, metasternum moderately densely clothed with long pale hairs, abdomen with moderate punctures, which are not closely placed. Front tibiae bidentate, apical tooth elongate and slightly curved, the upper tooth sharp and prominent, the larger claw finely cleft, the upper and lower part equal in size; the larger claw of the intermediate tarsi finely cleft, the two parts equal in size; hind tibiae very short and distinctly shorter than the femora and broadly dilated towards apex. Pygidium moderately punctate, punctures not deeply impressed. Length 10 mm., width 5 mm.

Texas, one female in collection Dietz.

By the unusually short and broadly dilated hind tibiae this species is easily distinguished from all our species. It is very closely allied to the Mexican *rhizotrogoides* Blanch., but seems to differ from that species by the more parallel form and the elytral sculpture.

**HORN'S SYSTEMATISCHER INDEX DER
CICINDELIDEN.**

BY VICTOR E. SHELFORD,
CHICAGO, ILL.

By far the great-majority of systematic papers (monographs and systematic lists) are written with respect to unnatural geographical

areas and as a result, usually without a comprehensive study of the group or groups concerned. Among American entomologists there is an especially strong tendency to practically stop at the southern boundary of the United States, although no barrier or faunistic discontinuity occurs in that region. While it will, no doubt, be generally admitted that a careful consideration of all evidence as to the point of origin, evolution, and dispersal of all groups is necessary for the building up of a natural system of classification, systematic papers which consider such questions are at least extremely rare. All of the above deficiencies are noticeable in former treatments of boreal American Cicindelidæ while the paper under consideration (Supplement* to Deutsche Entomologische Zeitschrift, II, 1905, 56 pp.) can be charged with none of them. It is the result of fifteen years of labor on the part of Dr. Walther Horn who has seen practically all the large collections of the world. The following are his conclusions regarding the Cicindelidæ (in broad sense):

The "Carabidæ stem" gave rise, in the Ethiopian tropics, to the first Cicindelidæ-like forms. These he calls the Protomantichoridæ; they were wingless insects (with elytra) most nearly related to two living South African families (of the Cicindelidæ in broad sense), viz.: (1) Platychilidæ, wingless forms with the usual type of elytra; (2) Palæomantichoridæ, wingless forms with fused elytra which turn under the sides of the abdomen. The Protomantichoridæ dispersed westward to America, pushed out to the north and south and after developing the Neomantichoridæ (*Omus*, *Amblychila*, *Pycnochila*) in the nearctic region, gave rise to the Prototetrachidæ, which inhabited the entire equatorial belt. Among these, complicated pilosity characters were later developed. Next forms became distinguishable by the development of two types of false pattern on the elytra; (1) brought about by partial loss of pigment, (2) by the development of a thicker pilosity in certain areas. The present predominating etched patterns are to be considered as the equivalent of such false patterns.

A wider step led to the production of the Protoeuryodidæ (*Euryoda*-*Odontochila*-*Cosmema*-like forms) which also inhabited the entire tropical region; a greater power of flight was developed among these. They gave rise to the *Cicindelæ* which constitute the young-

* Not sent to subscribers; can be obtained from the Deutsche Entomologische Gesellschaft, Berlin, for three mark.

est group of the Cicindelidæ. This genus is the result of a great amount of converging evolution, some forms having descended directly from the Protoeuryodidæ, many others having come indirectly as offspring of the Odontochilini, Dromicini and Theratidæ (families and subfamilies of the *Cicindela* in broad sense).

In the Holarctic region there are two northern tribes and two southern tribes of *Cicindela* concerning which the author presents the following hypotheses: The northern tribes arose in now warmer Africa during a cooler period; later the group separated into two parts, the smaller number moved southward to find a cooler climate and is now represented by *C. 4-guttata* Wdm. in South Africa; the greater number, however, moved northward and separated into two parts, one remaining in Eurasia and the other crossing over into North America. The two southern tribes arose in tropical America and part moved toward the south, possibly some representatives crossing over into the Australian region, while an equally large number moved northward, part remaining in the nearctic region and a part crossing over into Eurasia.

The *Cicindela* fauna of the Nearctic region is thus made up of: (1) The northern tribe or *purpurea-obscura* (*obscura-modesta*) group; frons broad and depressed, pilosity of head and prothorax erect: relatives, (a) the *soluta-hybrida-campestris* group in Eurasia, (b) the *4-guttata* group in South Africa. (2) The Southern tribe or *cupra-cens* group; frons narrow, not depressed, pilosity of head and prothorax decumbent; relatives (a) the *nivea-ritsemæ* group in the Neotropical region, (b) possibly the *helmsi-dunedensis-suetigera* group in the Australian region, and (c) the *elegans-trisignata* group in Eurasia. (3) The forms that have migrated in from the Neotropical *argentata* group; head bald, pronotum hairy on sides and disc; *unipunctata* Fabr., *belfragei* Sallé, *pilatei* Guer., *cursitans* Lec., and *celeripes* Lec., forms not understood by a study of the species of the United States alone, belong here. (4) Forms belonging to the indigenous Mexican fauna; head bald, pronotum pilose at the sides only. Our common *sexguttata* belongs to this group.

A similar analysis is made of the *Cicindela* fauna of each geographical region, the boundary countries of which (for this genus) are especially named. Other genera apparently do not present faunistic discontinuities and hence are not so treated.

So much for author's views. He has not (presumably on ac-

count of the nature of the paper) presented in detail the evidence in support of his theses and the reviewer is accordingly unable to give an analysis of the evidence upon which they rest. There is, however, much evidence that the Cicindelidæ originated in Africa, but their origin from wingless forms with elytra, I fear, will not meet the approval of insect morphologists. On the other hand, it is evident that *Tetracha* is in many of its characters a more primitive form than *Cicindela* and its distribution speaks well for the author's conclusions. His analysis of the nearctic *Cicindela* fauna and statement of its affinities must, it seems to me, stand unchallenged, while his arrangement of our species is the most tenable yet presented.

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Class I, HEXAPODA.

Order IV, DIPTERA.

ON THE KNOWN LARVÆ OF THE GENUS URANOTÆNIA.

BY EVELYN G. MITCHELL,
WASHINGTON, D. C.

The receipt during the past summer of larvæ of *Uranotania sapphirina* and *U. lowii* from Dr. T. W. Dupree gave an opportunity for a critical comparison of the three known larvæ of this genus, which had not previously been distinguished from each other. The genus, so far as can be judged by the known larvæ, is characterized as follows:

Four large stout spines bearing spinulæ instead of the usual four tufts in the middle of head; antennæ with a few scattered spines, the tuft represented by a single hair; stellate hairs on thorax and abdomen.

SYNOPSIS OF SPECIES

1. Antennal tuft decidedly over one third distad; longest terminal spine if bent backward would reach below tuft. Scales on eighth segment of abdomen not fringed on apical one-third (reckoned from center of base to tip). Central tooth of labial plate bluntly rounded and widely separated from adjacent teeth.

U. lowii.

- Antennal tuft scarcely if at all over one third distad2
2. Longest terminal spine almost as long as antenna; accessory spine on terminal joint not nearly reaching to tip of joint. Scales of eighth segment not fringed on apical one-half. Central tooth on labial plate bluntly rounded and not widely separated from the adjacent teeth.....**U. sapphirina.**
- Longest terminal spine scarcely two thirds the length of antenna, scarcely reaching tuft; secondary spine on terminal joint reaching nearly to tip of joint. Scales of eighth segment with a fringe of uniform spines extending over apex. Central tooth of labial plate sharp and distinct from the adjacent teeth..**U. socialis.**

Class I, HEXAPODA.

Order V, LEPIDOPTERA.

NEW NOCTUIDÆ FOR 1906.—NO. I.

By JOHN B. SMITH, ScD.,

NEW BRUNSWICK, N. J.

Leptina levitans, new species.

Ground color dull smoky gray without contrasts. Head and thorax with a whitish powdering, best marked on patagia, but not prominent on either of my examples. Primaries with the extreme base inferiorly a little paler but with no appearance of a white humeral spot and no defining or limiting line. Median space superiorly ashen gray, and a slight gray powdering is visible throughout the space. T. a. line barely traceable, a little irregular, with a small, somewhat even outcurve. T. p. line sinuate, even, narrow, gray with smoky borderings, not well defined. S. t. line very irregular, powdery gray, obscure, marked by obscure preceding dusky shades and at costa by an obscure dusky cloud which does not reach the apex. A series of dusky terminal spots. Orbicular wanting. Reniform of good size, almost round, concolorous, ringed narrowly with brown and with a brown central dot. Secondaries dirty yellowish or smoky, a little paler at base. Beneath, very pale smoky, with an obscure outer line and discal spot.

Expands. — 1.05–1.12 inches = 26–28 mm.

Habitat. — Ontario, Canada, A. H. Kilman; Durham, N. H., Weed and Fiske.

One male and one female are now before me, in comparison with three examples of *L. dormitans* with which I had in the past confused this species. I have realized for some time that there were two forms of *Leptina* without prominent white shoulders; but supposed them to be merely varying types of one species. The recent necessity for determining a series of specimens caused me to compare more closely and to resort to the original descriptions to determine the type form.

Guenée's description is clear and covers the species in which the s. t. line is prominently black shaded on costa while the new species lacks these black shadings completely, has the median lines more regular and has an obvious reniform. I have seen others, though I have only one pair at hand, and I have no doubt that its distribution will prove to be much the same as that of *dormitans*.

Charadra ingenua, new species.

Resembles *deridens* in general appearance and type of maculation but paler throughout. The primaries are of a decided bluish gray with the maculation neatly written and the secondaries are whitish or white, without trace of yellow and scarcely a trace of smoky toward the outer margin.

Expands. — 1.40–1.50 ♂, 1.72–1.76 ♂ = 35–44 mm.

Habitat. — Glenwood Springs and Durango, Colorado; end of June and beginning of July: Dr. Barnes.

Two males and two females in good or fair condition. I have for comparison seven examples of *deridens*, ranging from Canada to Florida and west to Pittsburg, and all agree in having a creamy tint to the gray of primaries and a decidedly yellowish shade to the secondaries. The absence of these shadings in the Colorado examples is the most conspicuous character, accompanied and emphasized by neater, better defined and yet less conspicuous maculation. The small departures from the eastern type in actual course of lines, etc., need not be specifically described.

Bryophila avirida, new species.

In size, wing form and general type of maculation very like *B. lepidula*, with all the green shadings eliminated. In the four examples before me and in comparison with the type form, none is as well marked as normal *lepidula* and the only well defined maculation is the brown shading on the costa between the orbicular and reniform spots. None of the maculation is as well marked in the western as in the eastern form and it seems probable that, while closely allied, we have a really distinct species.

Expands. — 1.06–1.24 inches = 26–31 mm.

Habitat. — Fort Collins, Colo., in June; Cartwright, Man., in June.

This species may be mistaken for *lepidula* until a careful examination is made, for the type of maculation is identical and the one is undoubtedly a descendant from the other; but when carefully compared the differences are sufficient in my opinion to authorize the new name.

Noctua monteclara, new species.

Head, thorax and abdomen of an almost uniform mouse gray; collar and patagia evident, but not prominent, vestiture mostly flattened hair. Primaries mouse gray

with the maculation almost entirely lost. By careful study it is possible to trace an almost upright, geminate t. a. line, a vague, diffuse median shade, a slightly irregular s. t. line and a large reniform which is somewhat constricted medially. Secondaries paler, more smoky gray, lightest at the base. Beneath, uniform, slightly more reddish gray, somewhat powdery, with an obscure dusky line on both wings.

Expands. — 1.12–1.15 inches = 28–29 mm.

Habitat. — Claremont, Calif., Mr. Carl Baker.

Two male examples in very fair condition, neither of them with date of capture. The species belongs in the *rubifera* series, but is distinguished from all of those known to me by its uniform mouse gray color on which the normal maculation is barely traceable.

***Euxoa claromonta*, new species.**

Head and thorax ashen gray, head a little paler; collar with a transverse, median black line; thoracic tuftings well marked. Abdomen a somewhat paler gray, lighter in the males than in the females. Primaries pale ashen gray, powdered with smoky; maculation not well defined, reniform and terminal space usually the darkest part of the wing. Basal line geminate, usually marked on costa and sometimes, also by black scales below the median vein. T. a. line geminate, marked on the costa in all specimens and below that either lost altogether or traceable across the wing; in the latter case nearly upright, a little outcurved in the interspaces. T. p. line geminate, inner part best marked and somewhat lunulate, only a little bent over cell and then about parallel with outer margin. S. t. line a little irregular, of the paler ground, defined by the dark terminal space and, sometimes, by a dusky preceding shade as well. A series of black terminal lunules, followed by a yellowish line at the base of the gray fringes. Claviform outlined in one example, barely indicated in others. Orbicular oval, oblique, tending to become irregular and incompletely closed above, more or less defined by black scales, followed by an annulus of the pale ground. Reniform moderate in size, kidney-shaped, ringed with pale and filled with blackish. Secondaries white with a variably marked dusky outer border, not differing much in the sexes; a narrow discal lunule. Beneath, gray, powdery, secondaries paler; a more or less defined outer line and discal spot.

Expands. — 1.25–1.40 inches = 31–35 mm.

Habitat. — Claremont, Calif., Mr. Carl Baker.

Three males and three females, no two alike. This is one of those obscure, variable species of the *pitychrous* series which is always troublesome when only single specimens are at hand. Its allies are *candida* and *detesta* though not readily confused with either when material is at hand for comparison. None of the specimens are dated.

***Mamestra pectinicornis*, new species.**

Head and thorax dull, smoky brown. Abdomen gray brown. Tarsi ringed with whitish and rather prominent. Primaries deep smoky brown over a lighter base, giving a somewhat powdery appearance. The median lines are barely traceable as somewhat more brownish scales occasionally edged by black scales. S. t.

line marked by obscure brown spots preceded and emphasized by black scales which may form a somewhat continuous shade and may break up into somewhat trigonate spots. There is a narrow black terminal line, the fringes are interlined with black and they are cut with black and yellowish brown. The orbicular is small, round, ringed by black scales, with or without a black central dot, filled with reddish brown. Reniform moderate in size, oval, outer half white, inner half reddish, the division between the two marked by black scales. The claviform is vaguely indicated by black scales. Secondaries dirty whitish at base, darkening to a smoky outer border. Fringes pinkish with a smoky line at base and smoky shadings toward apex. Beneath dull gray, primaries darker as a whole, on both the costal and outer margins darker, and on both a small blackish discal spot.

Expands. — 1.10–1.16 inches = 27–29 mm.

Habitat. — Palmerly, Cochise Co., Ariz., in July; Brooklyn Institute.

Two males and others in collections from the same general locality. The species is related to three Mexican species referred to *Eriopyga* by Hampson; but is obviously distinct from either. The antennae are lengthily pectinated, and this character combined with the white marked reniform will serve to distinguish the new form in our fauna.

Genus *URSOGASTRA*, new.

Head moderate in size, distinct, yet hardly prominent; eyes hairy, globose, of good size; front smooth; scarcely even bulging; antenna in male simple and in the female probably so; tongue well developed, functional; palpi small and weak, scarcely attaining the middle of front; vestiture even, composed mostly of projecting flattened hair. Thorax moderate, convex, collar well defined, patagia hardly relieved, a small posterior tuft; vestiture, flattened hair only without admixture of distinct scales; legs unarmed except by the usual spurs of middle and posterior pair, somewhat aborted and set with very dense brushes of thick hair so as to conceal the parts effectively. Abdomen without dorsal tufts; in the male the 4th, 5th, 6th and 7th segments furnished with lateral tufts of long hair which curve down and under, meeting on the median line of the venter; long brushes of specialized scales are also attached to the male clasping organs. The primaries are proportionate, only a little wider outwardly, venation apparently normal; on the cell beneath, in the male, a clothing of fine silky hair similar to that found in *Orthodes*. Secondaries with vein 5 reduced to a mere fold.

This genus is based on the peculiar combination of male characters and would come under *Eriopyga* Hampson and nearest to his section C., none of the species of which are cited as typical of discarded genera. I quite appreciate that this proposed name would find a resting place in the synonymy if secondary sexual characters are ignored; but I am scarcely ready to go so far at present.

As to the species here described, it is very strongly marked and I can find nothing among the descriptions to fit it.

***Ursogastra lunata*, new species.**

Head and thorax reddish fawn gray, immaculate. Primaries of the same reddish gray; basal line geminate, marked by brown or blackish scales; t. a. line geminate, very oblique, reaching almost the middle of inner margin; t. p. line geminate, broken, obscure, even, a little outcurved over cell, then almost parallel with outer margin; s. t. line pale, defined by brown scales on each side, almost rigidly parallel with outer margin. A series of small black terminal lunules; a yellow line at base of fringes. The ordinary spots are replaced by a large deep chocolate brown lunate mark, the concavity toward the costa, and this forms at once the most prominent and distinctive character. Secondaries dull smoky, with a darker discal spot and outer shade band; secondaries whitish, without marks.

Expands. — 1.25–1.30 inches = 26–28 mm.

Habitat. — Huachuca Mts., Ariz., Dr. Barnes; Palmerly, Cochise Co., Ariz., in August, Brooklyn Institute Collection.

Two somewhat defective males only are at hand. I cannot recollect that I have ever seen this species elsewhere.

Genus NOCLOA, new.

Head of moderate size, retracted rather than prominent; eyes naked, hemispherical, without bristly lashes; front protuberant, conical, obtusely terminated, with a roughened impression at tip; palpi moderately developed, reaching the middle of front, terminal joint short and knob-like; tongue moderately long, functional; frontal vestiture woolly, the hair somewhat flattened at tip; antennæ simple in both sexes. Thorax well developed, quadrate, vestiture of flattened hair, loose and somewhat diverging; collar and patagia well marked; a small frontal and somewhat well defined, partly divided posterior tuft; vestiture of underside long, loose, divergent; legs rather short, well developed, with hairy clothing, without spines, claws or other armature except the usual spurs of tibia. Primaries rather short in proportion to body, costa not very convex, outer margin obliquely arcuate; venation normal to all appearance. Secondaries proportionate, vein 5 weak, midway between 4 and 6.

This genus resembles *Cirrhophanus* in habitus, but differs from it and the surrounding genera to which I would have referred the species by the unarmed fore-tibiæ.

***Nocloa plagiata*, new species.**

Ground color a reddish luteous; the maculation is red, brown or deeper tinted. Head unicolorous or with only a faint inter-antennal line; collar brown tipped; tuftings a little darker than the ground. Primaries, basal line barely traceable, basal space of the paler ground except for a dark brown spot on the inner margin. T. a. line geminate, outer portion distinct, inner a mere line of brown scales, outwardly oblique, dislocated on the costal vein, outcurved in the interspaces. T. p. line geminate, outer portion obscure, inner narrow, linear, a little denticulate in the upper part of its course, widely outcurved over the cell, the included space a little paler than the ground. The median space is as a whole the darkest part of the wing, though not contrasting; a median shade, best marked on costa and just below darkens

the space between the ordinary spots and spreads out into the dark lower filling, to reappear on the inner margin. The orbicular is concolorous with the ground, large, irregular in form, not well defined. The reniform is large, broadly oval, concolorous, not well defined. The claviform is traceable, brown margined but not notably distinct. S. t. line narrow, whitish, irregular, preceded by a large blackish brown triangular patch on costal area and by a smaller, blackish spot opposite the cell. Through the fawn gray terminal space is an even, well defined whitish line before the base of the fringes, and followed by two narrow, broken brown lines. Secondaries dirty yellowish white with a dusky submarginal band and a vague discal spot. Beneath, primaries smoky, becoming reddish gray outwardly, s. t. space and line indicated; secondaries whitish, powdered with reddish gray over the costal region.

Expands. — 1.05–1.12 inches = 26–28 mm.

Habitat. — Arizona; southern Arizona, Poling; Palmerly, Cochise County in August, Brooklyn Institute Collection.

One male and two females in good or fair condition. I know of nothing with which this form is likely to be confused.

Nocloa rivulosa, new species.

Head and thorax reddish luteous, immaculate. Primaries dull luteous, markings darker, with an olivaceous tinge. Basal line traceable. T. a. line geminate, zig-zag, so as to confuse the entire basal area. T. p. line geminate, both parts distinct, narrow, rivulous in its course and as a whole parallel with the outer margin. The median shade is broad, somewhat diffuse, strongly marked, outwardly angulated in the middle of the wing, its course decidedly regular. S. t. line parallel with outer margin, rivulous, pale, preceded by a darker shade and followed by alternate light and darker lines parallel to its course, to the outer margin. Orbicular of moderate size, concolorous, not well defined. Reniform kidney-shaped, traceable with some difficulty. Secondaries dull whitish, outwardly darker, with an extra-median and terminal paler line. Beneath primaries yellowish to smoky, with a discal spot and pale s. t. line; secondaries pale, with a dusky discal spot and an outer dusky line.

Expands. — 1–1.20 inches = 25–29 mm.

Habitat. — Santa Barbara, Calif., Hy. Edwards Collection, Amer. Mus. N. H.; Yuma Co., Ariz., March, Mr. Hutson; Phoenix, Ariz., March 19, Dr. Barnes.

One male and two females in only fair condition. Two of these are very old examples, the third, the male, being the only recent example and making description possible. There is no danger of confusing the two species described under this generic name despite their general similarity.

HELIOTHINI.

The accumulation of undetermined material of this series in my collection led me to attempt its rearrangement recently — a task that has been simplified by Sir George F. Hampson's work; but which

nevertheless remains yet somewhat unsatisfactory because of the inadequately described Strecker species. The result of this study showed an unexpectedly complete series of the described forms and a large series of new species, which are herewith presented. That there will be further additions is certain, because many species are local and every new region will, almost inevitably, turn out new forms. Besides being local, many of the species are also solitary, individual examples being taken only at long intervals. For that reason it seems likely that few cabinets will have a good representation until all the localities have been well collected over.

I have accepted Hampson's separation of *Schinia* and *Lygranthæcia* but do not follow him in his suppression of *Heliothis* in the sense heretofore used: in fact I follow none of the changes made by him and based on the "first species as type" rule.

***Heliothis niveicosta*, new species.**

Ground color rather bright luteous, due to a whitish wash over a darker ground. Head and base of collar paler, tending to whitish on front. Primaries with costal region whitish, becoming white before the t. p. line, and cut before the apex. There is an obscure wash of whitish over the submedian vein, best marked in the median space and cut off at t. p. line. T. p. line diffuse, pale, well removed toward outer margin, obliquely sinuate from costa near apex, to inner margin one third from hind angle. S. t. space is the darkest part of the wing, followed by a narrow paler terminal space. Fringes of ground color at base, outwardly paler. Secondaries yellowish white, a little smoky, with a blackish discal spot and an outer band which is interrupted by a whitish blotch near middle of margin. Beneath, primaries blackish, with a narrow costal and inner, a broad outer pale border and a diffuse discal blotch. Secondaries whitish with a discal dark lunule.

Expands. — 1.15 inch = 29 mm.

Habitat. — Southern California.

One female in not the best condition, received years ago from Dr. Barnes, numbered 154. Indications are that the male may belong to the series in which there is a costal dilation, making it a *Heliocheilus*. Unfortunately the specimen contains no indication as to time or exact locality of capture.

***Thyreion stena*, new species.**

Head and thorax very pale citron yellowish, abdomen blackish with fine whitish vestiture that interposes a film over the dark ground. Primaries very pale lemon yellowish with a pink shade extending from base parallel to costa to the s. t. space; another, from same point extending through submedian interspace to anal angle, and a connecting shade through s. t. space which does not reach the costa but does reach the inner margin at anal angle. A pinkish shade over basal area generally. Fringes

shaded with pink. Secondaries uniformly smoky blackish with pinkish white fringes. Beneath, primaries blackish with pinkish white fringes secondaries with blackish disk shading off to paler and pink at the margins.

Expands. — .92–1.00 inch = 23–25 mm.

Habitat. — Golden and Fort Collins, Colo., in June.

Two males, one female; one pair from Prof. C. P. Gillette, one taken by myself at Golden.

I had confused these with *rosea*, which is a larger species, more deeply tinged and with less pink. The material in this series is not abundant and the range of variation is not known; it is quite probable, however, that specimens with much less pink will be found and there may be immaculate forms.

***Melicleptria antonio*, new species.**

Head, thorax and abdomen black; clothed with thin, divergent yellow and carmine hair on thorax, the terminal segments of abdomen yellow. Primaries carmine at base and to the t. a. line, which extends inwardly oblique from two-fifths of costa to one-third of inner margin: the line itself diffuse, whitish, median space yellowish with a luteous tinge, shaded with carmine on the costal and inner margins; s. t. space very even, carmine near costal and inner margin, olivaceous brown between these points. Terminal space testaceous except at anal angle, where the carmine shading becomes marked. Fringes yellow. The orbicular is an obscure, diffuse blotch. Secondaries black with a bronzed shading; fringes white. Beneath, primaries smoky black, the apical region of costa and apex carmine, fringes whitish; secondaries smoky black, costa carmine to apex which is yellowish, that color extending on fringes almost to the hind angle.

Expands. — .55 inch = 14 mm.

Habitat. — San Antonio, Tex., in April.

A single male specimen in very fair condition from Dr. Barnes. The species has the narrow wings and depressed costa of *pulchripennis* and is the smallest species of the genus in our fauna.

***Melicleptria sabulosa*, new species.**

Head, thorax and abdomen black, more or less densely clothed with yellowish white divergent hairs, which give the prevailing tint to the head, thorax, and terminal segments of the abdomen. Primaries with the basal space yellowish, more or less washed with carmine to the t. a. line which is diffuse, distinctly carmine, and is inwardly oblique from two fifths of the costa to one third of the inner margin. Median space dull yellow, costal region smoky or carmine. T. p. line carmine, almost parallel to outer margin, outwardly diffuse and merging through the s. t. space into a broad, dull yellowish terminal space. Fringes carmine. There is a narrow, obscure, upright reniform, without definite margins. Secondaries black, with whitish fringes; in the male with a whitish median band, in the female without markings of any kind. Beneath, primaries yellowish with blackish shadings along costa at base, and out-

wardly, not extending to the apex; secondaries black with a yellowish median band and a more or less obvious shading along the costa and at apex.

Expands. — .66-.70 inch = 16.5-17.5 mm.

Habitat. — "California"; Doble, Calif., April 19.

One male from Mr. Henry Edwards; one female from Mr. George H. Hutson; both in good condition. The male, received many years ago from Mr. Edwards, is faded, and has the peculiar livid hue of desert species; the female from Mr. Hutson has the same desert characteristic, but is more brilliant, and has the distinct carmine washing that is lost in the older example. The whitish band of the male is indicated in the female and, I doubt not, occasionally occurs in the latter sex. In wing-form, the species resembles *antonio* and, indeed, the general type of maculation is similar. In general, the resemblance is to *fasciata* Hy. Edy., which has a distinct s. t. line and shade.

***Melicleptria cresina*, new species.**

Head, thorax and abdomen black, covered with olivaceous yellow hair, which is scant on the abdomen except at tip. Primaries, base and s. t. space carmine, median space yellow except on costa; terminal space luteous with an olivaceous tinge; fringes chocolate brown at base, olivaceous at tip. T. a. line from costa one third from base, outwardly curved to the middle, there forming an angle and running inwardly oblique to within the basal third. T. p. line a little sinuate, but on the whole nearly parallel to outer margin. S. t. line irregular, marked only by the contrast between s. t. and terminal space. Orbicular large, dusky, with a carmine suffusion, obscurely defined. Secondaries black with a narrow, clear white median band which is broader toward costa but reaches neither costa nor hind margin; fringes yellowish. Beneath, black with a median white band on both wings, that on the primaries broken by a blackish reniform spot; costal margin of secondaries and apex of all wings yellowish.

Expands. — .64-.75 inch = 16-19 mm.

Habitat. — Los Angeles County, Calif., in April.

Two females in good condition collected by Mr. Koebele. The resemblance is to *H. fasciata* Hy. Edwards, which, however, is generically distinct. The wing form is like that of *pulchripennis* and to the series typified by that species, the present form belongs. There is a close general resemblance to *sabulosa*, which is not borne out on more particular examination.

***Melicleptria sexata*, new species.**

Head and thorax black, densely clothed with thin loose olivaceous or grayish hair. Abdomen black in the female, more olivaceous in the male, the difference due to the more abundant vestiture of the latter which conceals the ground. Primaries

smoky brown with an olivaceous tinge or overlay, median space yellowish or whitish, terminal space a little paler to the yellowish fringes. The solid brown basal area is outwardly bounded by the outcurved t. a. line which is pale like the median space. T. p. line is also pale, only a little sinuate and separates the pale median space from the solid brown s. t. space. S. t. line whitish, diffuse, broad, very close to the outer margin. The large reniform is of the darker color and fills a large portion of the upper portion of the median space. Secondaries black, with traces of a tawny median band in most specimens. Beneath, primaries black except apex, median space and fringes, which are yellowish; a large black spot in the median pale area; secondaries black except along costa and an incomplete, interrupted median band.

Expands. — .68-.72 inch = 17-18 mm.

Habitat. — Aweme, Man., July 21, Mr. Criddle; Roundthwaite, Man., Marmont.

Three males and four females, all in at least fair condition. Two pairs are from Aweme, one male is from Roundthwaite and two females, dated July 27, have no locality label. The species is allied to *villosa*, than which it is smaller, stouter, with the secondaries almost solidly black.

***Melicleptria subatra*, new species.**

Head and body black; vestiture thin, olivaceous yellow, slightly tinting the head, thorax and terminal segments of abdomen. Primaries smoky to blackish with an obscure carmine tinge. Median space yellowish or whitish, costa and inner margin of the smoky ground, reniform very large, blackish, combining with the costal and marginal shadings to break the pale area in the three more or less connected blotches. S. t. line distinct, yellowish, outwardly diffuse, a little sinuated, fringes whitish. Secondaries black or a little bronzed, with a whitish or yellowish median band which is completely divided by the large blackish discal spot. Fringes whitish. Beneath, primaries creamy yellowish, upper half of base and all beyond t. p. line except apex blackish, a large, constricted discal spot also black. Secondaries creamy yellowish, inner margin and a discal spot black.

Expands. — .80-.90 inch = 20-22 mm.

Habitat. — Mt. Rainier, Wash.; Gallatin Co., Mont., elevation 9,400 feet, July 10.

Two males and one female in tolerably good condition; one male and one female numbered 631 of the Washington Experiment Station. In type of maculation this resembles *sueta* = *californica*; but it is much smaller, lacks all the carmine shadings and is altogether a more sordid form.

***Melicleptria triolata*, new species.**

Head, thorax and abdomen black, clothed with thin, divergent whitish hair. The thorax is scarcely more heavily clothed than the remainder of the body and the whole impression is of a thin fleecy covering. Primaries with base, s. t. and terminal

spaces dull, smoky ; median space and the broad subterminal shade line pale yellowish. Basal space uniform, smoky, overlaid by yellowish hairs. T. a. line with an inward tooth on the median vein, else as a whole outcurved. T. p. line outwardly oblique from costa, forming a sharp angle on vein 4, thence with a moderate incurve to base. S. t. line broad, diffuse, pale, only a little irregular. Fringe pale. Orbicular moderate or small, smoky. Reniform large, smoky, oblong, only a little constricted medially. Secondaries black, with yellowish fringes, and with a yellow discal area in which is a large black discal blotch. Beneath, dull whitish, median area with a yellow tinge, the darker portions of upper surface showing through. Primaries with a small black orbicular and a large black reniform. Secondaries with a large, black, lunate spot.

Expands. — .67-.72 inch = 17-18 mm.

Habitat. — Los Angeles Co., Calif. ; Argus Mts., Calif., in May.

One male and two females, two of them in very fair condition. The specimen from the Argus Mts. was collected by Koebele, belongs to the National Museum and has a little more of the desert habitus than the other examples which, while collected in an arid region, were not so distinctly in a desert area.

***Melicleptria dobla*, new species.**

Head, thorax and abdomen black, more or less clothed with yellowish white scales. The collar has a blackish median line and the abdomen is bare of white vestiture except at base and tip. Primaries blackish brown or smoky, with an overlay of whitish scales which is irregularly distributed and probably varies ; median space whitish, powdered with blackish below vein 2. Basal line whitish, marked on costa. T. a. line whitish, more or less confused with median space, as a whole with an even outcurve. T. p. line evenly and rather deeply sinuate, S-shaped, clearly defined, though narrow. S. t. line narrow, whitish, irregular. A series of blackish terminal lunules. Fringes of the dark ground color. Orbicular traceable as a black shade on t. a. line ; but not distinct. Reniform large, subquadrate, blackish, the most prominent feature of the wing. Secondaries black with white fringes. Beneath, primaries black at base ; median space yellowish with a large black reniform, outer area black, apex yellowish. Secondaries black except along costal and outer margins, which are yellowish. Body black, breast with yellowish fine divergent vestiture.

Expands. — .78 inch = 19.5 mm.

Habitat. — Doble, Calif., April 5.

One good female collected by Mr. George S. Hutson. It is totally different from all the other species with black secondaries and has no very close allies in the genus.

***Melicleptria edwardsii*, new species.**

Head and body smoky brown ; vestiture of head and thorax dull brown, tipped with yellow, giving a yellowish cast to the surface. Abdominal vestiture smooth, edges of the segments narrowly pale-ringed. Primaries dull smoky brown over a sordid pale tawny. The basal and s. t. spaces are mostly smoky brown ; the median

space is mostly tawny and the diffuse s. t. line is of the same tint. Basal line single, distinct, pale. T. a. line broad, tawny, edged with black and brown scales, its course an almost even outcurve, a trifle broken on the median vein. T. p. line dirty whitish, with almost a rectangle on vein 5, and running inwardly oblique and a little incurved below. S. t. line very irregular, so deeply indented opposite the cell that the s. t. space is nearly cut. Terminal space narrow, smoky, with a darker brown terminal line. Median space marked with dull brown inferiorly. Ordinary spots very large, dull brown, almost completely filling the cell. Secondaries tawny with a large black discal spot and a broad marginal band in which there is a tawny outer line near the angle. Beneath, primaries very pale tawny, discal spots of upper side distinctly, other maculation more faintly reproduced; secondaries with a decidedly coppery red tinge; a large black discal spot and a diffuse submarginal shade toward anal angle.

Expands. — .92 inch = 23 mm.

Habitat. — Yellowstone Park, Wyo., in July; Burrison, collector,

One female in good condition, save that the antennæ are wanting; received through Mr. W. D. Kearfott. The species is so utterly unlike any other species heretofore referred to the genus that there should be no difficulty in identifying it.

***Melicleptria flavidentia*, new species.**

Head, thorax and abdomen black, clothed with olivaceous yellow hair, most dense on thorax and at the tip of the abdomen. Primaries with a carmine shading in basal and s. t. spaces; median space prevailing yellowish; s. t. space and extreme base olivaceous. The t. a. line makes a very marked and characteristic inward tooth on the median cell and thus relieves the orbicular which would otherwise be absorbed in the basal area as it is in *sucta*. T. p. line marked by the difference in shade between median and s. t. space, sharply defined, only a little sinuate. S. t. line not marked: there is simply an olivaceous shade between the carmine red of the s. t. and terminal spaces. Fringes pale olivaceous. The inner and inferior portion of median space are tinted with olivaceous. Orbicular large, obtusely oval, carmine. Reniform large, oblong, broad, angles rounded, outer margin a little indented at middle, carmine shaded. Secondaries black, with olivaceous yellow fringes. Median area yellowish, with a broad black discal spot which cuts the band and gives the wing an appearance of being black with two yellowish median spots. Beneath, body clothed with thin, yellow, divergent hair. Primaries, basal area black with a yellow, sagittate central mark; median area yellow with a large, black discal spot; s. t. space yellow from costa nearly to inner margin, this shade gradually narrowing until it is entirely lost in the broad black band at inner angle. Secondaries, pale yellow; black at base; median area with a large black discal spot. A narrow black extra median line merging into a black band toward anal angle.

Expands. — .92 inch = 23 mm.

Habitat. — Utah, July, 1900.

One male from Dr. Barnes, in good condition. The species looks, at first sight, like a small example of *sucta*; but the character-

istic indentation of the t. a. line and the other distinctions pointed out, justify the new species.

***Schinia macroptica*, new species.**

Head and thorax with an ochereous brown powdering over a luteous base; abdomen dull yellow. Primaries with median space silvery white, else luteous with ochereous brown powderings; a large somewhat transversely oval ochereous brown reniform making the most conspicuous feature of the wing. T. a. space powdery, extending to the t. a. line, which is rigid, a little oblique, and marked only by the contrast of silvery median and ochereous basal space. T. p. line marked in the same way against the s. t. space, even in course, rather widely bent over the large reniform then evenly oblique to the hind margin. S. t. line pale, very irregular, almost cutting the s. t. space opposite cell. Apex and upper portion of terminal space golden brown, shading into the palest ground at anal angle. A series of deep brown terminal marks. Fringes luteous, not cut or interlined. Secondaries whitish at base, with a broad washed-out outer band and whitish fringes. Beneath, primaries smoky, paler at base, with a large blackish discal spot and a yellowish s. t. line. Secondaries white with a faint yellowish tinge.

Expands. — .86 inch = 21 mm.

Habitat. — Southern Arizona, Poling.

One female without date or definite locality, but probably from Pima County in September. The very large discal spot of primaries, shaded with golden brown in the silvery white median space, marks this species at once. From *oculata*, to which the new form is allied, it differs by the much broader basal and outer luteous areas, as well as by the much larger and differently shaped reniform.

The tibial armature consists of a long, not very pointed inner claw and a stout spine above it, while on the outer side are two shorter, claw-like spines.

***Schinia biforma*, new species.**

Head and thorax tawny yellow; abdomen clothed with thin hair of the same color over a black base. Primaries deep tawny over a lighter yellow base. The median lines are broad, of the pale ground, diffuse, tending to broaden toward the center so as to lighten the median space. T. a. line nearly rectangularly bent above the middle. T. p. line feebly bisinuate. S. t. line obscure, even, of the pale ground. Fringes pale. No discal spots. Secondaries evenly black, with yellow fringes. Beneath primaries blackish, apex and margins more or less tawny; secondaries pale tawny, shaded with blackish toward the inner margin.

Expands. — .76-.80 inch = 19-20 mm.

Habitat. — Kerrville, Texas.

One male and two females, the former in poor, the latter in good condition. In size and wing-form the species resembles *roseitincta*; in

the uniformly black secondaries and tawny simply marked primaries it differs from all others of the genus. The vestiture of the head and thorax is predominantly hairy and rather close. The fore tibia has one long somewhat curved inner claw and two spines above it, while at the outer side it has three shorter claws decreasing in size from the tip.

***Schinia olivacea*, new species.**

Head and thorax olivaceous gray, the greenish tinge quite obvious; abdomen with a thinner covering of olivaceous over a brown base. Primaries, basal space brown, with a distinct reddish tinge at the base which becomes overlaid by olive green until at the t. a. line it is the darkest part of the wing. T. a. line pale, rather evenly and not very much outcurved. Median space olivaceous gray, forming the palest portion of the wing anteriorly, darkening to a more intense olivaceous outwardly until it merges into the s. t. space, obscuring the very narrow gray t. p. line which is even, obliquely bisinuate. S. t. line greenish gray, distinct, very even, parallel to the outer margin. A broken, black terminal line. Fringes cut with brown. Secondaries an even brownish black, fringes whitish. Beneath, primaries smoky except on the costal margin and fringes; the latter cut with blackish, the former by a t. p. line; secondaries costal half dull yellowish gray, with a discal spot and outer line, inferior half blackish, fringes yellowish.

Expands. — .84 inch = 21 mm.

Habitat. — Beeville, Tex., in October.

One female only, dated in 1895. I feel quite sure that I have seen other specimens of this but have no record. It is allied to *arcifera* and the male may differ in color. The anterior tibia has one long pointed inner claw and three smaller outer spine-like claw-processes.

***Schinia ferricasta*, new species.**

Head and thorax light chestnut or somewhat rusty brown; abdomen more yellowish. Primaries with basal space pale chestnut brown. T. a. line whitish, outwardly merging into the pale median space, with a wide and rather even outcurve. T. p. line whitish, well defined, evenly and very slightly bisinuate. Median space dull luteous gray with a brown tinge outwardly. S. t. space velvety brown, a little less red than in basal space, lightening a little toward the outer margin to indicate a vague pale s. t. line. Fringes concolorous with terminal space. A vague indication of a reniform is traceable. Secondaries a somewhat deep coppery yellow from base to beyond middle, where a blackish shading begins, extending to the outer margin. Fringes lurid yellow. Beneath, primaries tawny yellow to beyond middle, a blackish s. t. space and a rosy red terminal space; discal spot black; secondaries yellow at base shading to rosy and then to brownish outwardly.

Expands. — .92-1.00 inch = 23-35 mm.

Habitat. — Palmerly, Cochise Co., Ariz., August, Collection Brooklyn Institute; Baboquivaria Mts., Pima Co., Ariz., July 20;

Mr. O. C. Poling: Huachuca Mts., August 1-7; Santa Catalina Mts.; Pinal Co., August 24, Dr. Barnes.

Five male specimens, the one from the Brooklyn Institute in perfect condition, the others somewhat defective. The species is obviously related to *arcifera* and may be an extreme form of it; but I do not believe that likely. The new form is altogether lighter as a whole, and the median space is contrastingly paler. The median lines also, while similar in course, are much broader and more conspicuous. It is probable that the female will be found to have black or brown outer secondaries.

The tibial armature consists of one long inner and two shorter outer claws with the accessory spines small and defective.

***Schinia erosa*, new species.**

Head, thorax and primaries except median space a rather bright luteous. Head and thorax immaculate. Primaries with well defined maculation, the median space white or whitish, contrasting or with a wash of the ground color which obscures the bright effect. The basal space has no markings and is only a little curved at its outer border which is well defined. The outer portion of the median space becomes a little luteous shaded below the reniform, deepening so as to relieve a whitish t. p. line which is well curved over the cell and a little incurved below. S. t. line whitish, very irregular, appearing as though gnawed from the outer side, this appearance heightened by a preceding dusky shade which becomes black at some points along the edge of the line. There is a very narrow pale line at the base of the fringes which are obscurely cut with pale. The orbicular is vaguely indicated by a few dull scales. Reniform of good size, oblong, a little oblique, dusky, the outer border marked with black scales. Secondaries whitish to beyond the middle, then a rather broad, irregular, diffuse smoky or blackish band, beyond which the terminal area is yellowish to the whitish fringes. There is a large black discal spot. Beneath, whitish; primaries with a small round orbicular and a large oblong reniform, black, contrasting, s. t. line of the upper side being even more sharply marked than above: secondaries with the discal spot and extra-median band of upper side duplicated.

Expands. — .80-.88 inch = 20-22 mm.

Habitat. — Utah; Phoenix, Ariz., Sept. 16 and 24.

Three examples, one of them a female, are at hand. The Utah example is old and its source is not known as it has only one of the old State labels. Of the Phoenix examples one belongs to Dr. Barnes and bears his number 123; the other was given me by Mr. Wm. H. Broadwell and is the best specimen of the three.

The fore tibial armature consists of one very long pointed claw at the inner angle and above it two or three spines along the inner margin; one moderately long pointed claw at the outer angle and two smaller claws above it on the outer side.

Schinia pallicincta, new species.

Head and thorax pale lemon over clay yellow; abdomen a little paler. Primaries yellow luteous over a whitish base, the median lines broad, whitish, diffuse. T. a. line nearly upright. T. p. line oblique a little outcurved over cell. In one specimen the s. t. line is quite well defined near costa by preceding brown scales; in the other it is almost lost. No discal spots. Secondaries blackish with a rosy red tinge; fringes pale. Beneath, primaries yellowish with blackish disk and discal mark a little tinged with rosy. Secondaries yellowish with a smoky disc which is strongly tinged with rosy.

Expands. — .72-.80 inch = 18-20 mm.

Habitat. — San Diego County, Calif.; Utah.

Two female examples, both somewhat defective. The two examples are very much alike in appearance and essential structure; but differ in that the Utah example has a very distinctly marked s. t. line which in the California example is obscure. The former is to be considered the type should the latter prove to be distinct. The fore tibia has a very long inner curved claw and two shorter outer claws also slender and somewhat spine-like.

Schinia tobia, new species.

Head and thorax olivaceous luteous over a whitish base. Abdomen whitish. Primaries dull olivaceous with the transverse markings broadly white. Extreme base white. T. a. line a broad white band, inwardly defined, outwardly diffuse, broader on the costa and internal margin, a little outcurved. T. p. line broad, white, margins not sharply defined, tending to broaden on costa and inner margin. S. t. line a little irregular, undefined, not strongly marked. S. t. space is darker than ground on costa and internal margin, and paler between these points; but no well marked blotching occurs. Fringes a little paler than ground. The reniform is a whitish lunule which may become almost or quite obsolete. Secondaries whitish, with a dull olivaceo-luteous outer margin; fringes white. Beneath white, primaries a little gray shaded and sometimes with a discal spot.

Expands. — .92 inch = 23 mm.

Habitat. — Phoenix, Ariz., September 16-23.

Two good females, through Dr. Barnes; very similar in appearance and obviously allied to *sexplagiata* and *biundulata*, really in a way intermediate, yet differing from both. The fore tibia has a long, slender, pointed inner claw with two much smaller spines above it, and two shorter outer spine-like claws and smaller spines above them.

Schinia constricta, Hy. Edw.

This species has long been a puzzle to me and I have been keeping close watch for specimens since I first saw the type in 1882; but until recently without success. In my Revision of 1883 I note that,

"It is closely related to the preceding [*rivulosa*] while easily separated from it." The characteristic feature in which the species differs from all its congeners is that there is no complete median space and there are no median lines. From the costa a t. a. line starts normally, but instead of crossing the wing it forms a segment of a circle, reaching the costa again at the place of the t. p. line. On the inner margin a similar mark occurs and between the two segments the ground color extends through the center of the wing.

On the occasion of a visit to Boston in September, 1905, I had opportunity to look over the very interesting collection of Mr. H. H. Newcomb and found to my delight an example of *Schinia constricta*, though not exactly typical. It came from New York in the Emily L. Morton collection, was marked New Windsor, 22, VII, '91, and was a unique. It had the lines marked as in the type; but the dark shading did not extend across the median space and which was quite obvious throughout. The relationship to *rivulosa* was now so clear that I determined we had only an aberration to deal with and looked over my own specimens, finding a clear tendency to narrow the space between the median lines. One example had them so nearly approximated that the space was all but divided and was a perfect intermediate between the normal form and the New Windsor specimen.

Constricta must, therefore, in future rank as an aberrational form of *rivulosa* and not as a distinct species. The original type is from North Carolina and as the second specimen is from New York, the aberration may occur anywhere within the range of the species.

***Schinia accessa*, new species.**

Ground color silvery white, overlaid by pale olive green, so that only the lines show the ground. Head, edge of collar and patagia and disc of thorax white marked. Abdomen whitish. Primaries with the transverse lines in the form of broad, oblique white bands. Basal space shaded with white above and below the median vein. T. a. line with a long outward tooth on the cell extending almost to reniform, inwardly oblique below. The band is inwardly bounded by a darker edging, outwardly without a sharp defining edge between the white and olive. T. p. line very oblique with a little outcurve over cell and a little indrawing below; inwardly undefined, outwardly edged by black scales which may form spots. S. t. line narrower, white, even, close to and parallel with outer margin; fringe white. The reniform is in the form of an oblique, elongate lunule with the margins black, the center concolorous. Secondaries white, with a more or less distinct outer blackish band and a blackish discal lunule. Beneath, primaries whitish, with the maculation of upper side incompletely reproduced, the reniform black filled and the orbicular present as a black spot. Secondaries also with markings of upper side feebly indicated.

Expands. — 1.04–1.16 inches = 26 – 29 mm.

Habitat. — Kerrville, Texas.

I have two female specimens, one well preserved though papered, the other without locality and somewhat rubbed, from Dr. Barnes, but almost certainly from Kerrville also, though by a different collector. The armature of the fore tibia consists of a heavy inner claw, above which is a curved stout spine and a series of small spines, and three outer blunt claws decreasing in size toward base.

The species is allied to *trifascia* in appearance and belongs next to it in Hampson's arrangement, differing most obviously in the angulated t. a. line and huge reniform spot.

***Schinia alensa*, new species.**

Ground color dull creamy white, the markings olivaceous luteous. Head and thorax immaculate, thorax a little washed with luteous. Basal space luteous, darkening a little to the t. a. line which is defined by the contrast between basal and median space and is evenly arcuate. Median space white to the t. p. line which is evenly bisinuate, marked by the contrast between median and s. t. space, the median space broken by an outer, diffuse shade which may form a somewhat even band and may broaden inferiorly so as to leave only broad pale median lines. S. t. space olivaceous luteous, almost cut opposite the cell by a deep indentation from the pale terminal space. A series of dusky or blackish terminal marks at the base of the dusky fringes. The reniform is marked by two small black dots connected by a narrow line of black scales. Secondaries white, with a dusky, obscure outer border and a faint discal spot. Beneath, primaries creamy gray with a large, blackish discal mark. Secondaries white, immaculate.

Expands. — .86–1.00 inch = 22–25 mm.

Habitat. — Southern Arizona, August 1–15, Poling; Wilgus, Cochise Co., Ariz., no date.

Two males and two females in fair condition, a pair from each locality, through Dr. Barnes. There is some variation in the intensity of the darker shading and some in its extent; but as a whole the specimens look very much alike. The relationship is to *separata* with which the new species agrees in tibial armature.

***Schinia illustra*, new species.**

Head and thorax rather pale ochereous yellow, abdomen whitish yellow. Primaries a little deeper in ground than the thorax, the shadings in brownish ochre. T. a. line even, with a moderately long median angulation, preceded by an ochre-brown shading and marked by a few dark scales outwardly — otherwise the line is concolorous. The outer portion of median space is filled by an ochre-brown shade which includes the t. p. lines, invades the s. t. space and from which rays extend along the veins to the outer margin. T. p. line of the ground color, outwardly denticulated on the veins, in course very evenly bisinuated. There is no s. t. line. Orbicular want-

ing. Reniform an irregular, linear, whitish line, with a deeper brown shading on each line. Terminal dots on some of the veins, the brown shadings crossing the whitish fringes. Secondaries, whitish, with a lustrous yellowish reflection. Beneath, whitish, with a yellowish shading; primaries with a blackish discal spot, some brown subapical spots and brown marks on the fringes; secondaries with an obscure subapical brown shading.

Expands. — 1.10 inches = 27 mm.

Habitat. — Glenwood Springs, Colo., July 20.

One good female which has been in my hands for years, originally received from Dr. Barnes. The fore legs are missing hence the armature cannot be described; but it is probably not unlike that of *walsinghami*, to which the new species is most nearly allied. The most characteristic feature of the species is the absence of an s. t. line and the rayed terminal area.

***Schinia megarena*, new species.**

Head and thorax creamy white, more or less tinged with ochereous brown. Primaries, ground color a rather dull white, the maculations and shadings formed by ochereous and brown scales. The large, blotch-like reniform, which is more or less marked by black scales is the only conspicuous feature of the wing. The extreme base is white, the brown powderings darkening gradually to the narrow t. a. line which is somewhat irregularly angled and, as a whole, nearly upright, emphasized by a few black scales. The median space is white to beyond its middle, then darkened by a powdery ochereous band which crosses the reniform and runs close to the t. p. line inferiorly. T. p. line geminate, the inner line powdery and obscure, the outer marked with black scales, a little irregular and sometimes almost lunulate; in course with a long outcurve over cell and a moderate incurve below reniform. S. t. space brown, powdered, very irregular outwardly where it marks the whitish, diffuse s. t. line. Terminal space brownish powdered except at apex, which is usually white. A series of terminal black lunules. Fringes ochereous, with a white interline. The orbicular may be absent or may be marked by a narrow, incomplete ring of black scales. Secondaries white. Beneath, primaries with a slightly gray tinge, with prominent reniform and a more or less well defined orbicular — though the latter may be entirely wanting.

Expands. — .88–1.00 inch = 22–25 mm.

Habitat. — Kerrville, Tex.; Utah, August 4 to September 6, Poling.

Nine males and four females all from Mr. Poling. Only one male is from Kerrville, the others have simply the “Utah” and date label. All the examples are a little worn or defective.

In a general way this resembles a bleached out *S. tertia* with immaculate secondaries. The type of maculation is the same; but the details vary greatly and this is not nearly so handsome a species.

Eupanychis camina, new species.

Head and thorax dull, smoky luteous, some of the thoracic scales with a metallic lustre. Primaries smoky black over a dully whitish base. Basal space blackish, extends fully one third of the wing, limiting the t. a. line by the contrast in color with the pale median space. In course the line is somewhat acutely and a little irregularly outcurved. Median space whitish, more or less black powdered, interrupted by the large, oblong, black reniform. T. p. line rather evenly bisinuate, best marked by the contrast with the black s. t. space. S. t. space black with a dusting of whitish scales, narrowed by the outcurve of the t. p. line. S. t. line whitish gray, diffuse, a little irregular, darkening outwardly into the smoky terminal area. A broad, black, lunate terminal line. Fringes smoky at base, whitish at tip. Secondaries black, disc whitish with a large black discal spot almost dividing it, fringes tipped with gray. Beneath, primaries with maculation of upper side essentially reproduced but more contrasting. Secondaries mostly whitish with black basal and discal spots and a black margin which is incomplete apically.

Expands. — .76 inch = 19 mm.

Habitat. — Hampton, New Hampshire, Weed and Fiske, No. 2164.

One female specimen in fair condition. It is obviously allied to *spinosa* in general appearance; but is smaller, entirely without red-brown admixture and not nearly so well marked. It has almost the appearance and color of a diminutive *Heliothis*.

Thalpochares hutsoni, new species.

Ground color a faint creamy white, varying toward luteous. Head thorax and abdomen concolorous, immaculate. Primaries as a rule a little darker than body, the maculation a darker shade of the ground color with a slight olivaceous tinge in the best marked specimens. Basal line discernible in one specimen, broad, diffuse, broken. T. a. line broad, single, faintly relieved, with a rather even outcurve, recognizable in about half the specimens and distinct in one. T. p. line a distinct band, a little sinuate, as a whole nearly parallel with outer margin, broken by the round reniform which is concolorous with the band and is cut out of it by a whitish outline. A median shade band extends from the middle of costa to the t. p. line below the cell; but is complete in one example only. Terminal space is a little darker, but no s. t. line is relieved. A series of black terminal dots. Secondaries whitish with a faint yellowish tinge, fringes white. Beneath, primaries smoky; secondaries white.

Expands. — .64 inch = 16 mm.

Habitat. — Yuma Co., Ariz., in March, Mr. Hutson.

Six examples, evenly divided as to sex, and all in good condition. This little species is neatly if inconspicuously marked, and is named after its collector, from whom I have received not a few novelties as the result of his desert wanderings. That these explorations were primarily for gold and that the capture and care of the specimens

added much to the labors of the journey does not detract from Mr. Hutson's merit. No one sends better specimens than he does!

This species also has the cylindrical frontal process and will be associated with *catalina*, I believe.

***Thalpochares catalina*, new species.**

Head, thorax and abdomen white, slightly lustrous. Primaries white, with a slight creamy tinge; immaculate to the middle, and nowhere with contrasting maculation. Beyond the middle of costa a vaguely luteous band bends outwardly through the cell, there forms an obtuse angle inward, becomes better marked and broader, reaching the inner margin a little beyond the middle. This band varies in width and in distinctness. At the outer border is a broad margin of faint bluish gray, through which the white, slightly sinuous s. t. line is traceable. A series of black terminal dots is obvious in one specimen. Fringes white. Beneath; primaries blackish, fringes white; secondaries white.

Expands. — .80 inch = 20 mm.

Habitat. — Yuma Co., Ariz., April 19, Hutson; Babaquivera Mts., Pima Co., Ariz., July 16-23, Dr. Barnes; Tuscon, Ariz., May 13-14 and Catalina Springs, Ariz., July 5, Mr. E. A. Schwarz.

Three males and three females, half of them in rather ragged condition, yet all characteristic. Seems to be rather widely distributed, yet obviously not over-common.

It is probable that this species will have to be removed from *Thalpochares* eventually, because like so many of our desert forms, this has a frontal protuberance, cylindrical and truncate, covered by the vesture in good examples but readily exposed. I do not propose a new generic term here, because the species of this and allied genera are not well represented in collections and the limits of the genera already named are by no means accurately defined.

***Bomolocha lotalba*, new species.**

Ground color a dirty luteous gray; head and thorax immaculate, abdomen paler, with narrow whitish segmental rings. Primaries more or less shaded with smoky, with a conspicuous rigid narrow yellowish s. t. line, more or less defined by a dusky preceding shade, more distinct in the male than in the female. T. a. line single, smoky, rather broad, somewhat diffuse, with small outcurves between the veins and as a whole a little outcurved. T. p. line narrow, smoky, not well defined, irregular yet scarcely crenulate, well curved over the cell and as deeply drawn in below. There is a broken, scarcely lunate terminal line. Reniform an obscurely defined dusky blotch of moderate size. Secondaries whitish; there is an outer, rigid yellowish line abruptly bent near anal angle, preceded by a dark shading, which seems like a continuation of the s. t. line of primaries; toward the base there is a less distinct continuation of the t. a. line of primaries. Beneath, both wings with a slight reddish tinge, powdery, with smoky median and extra-median lines and a dusky discal spot.

Expands. — .92–1.00 inch = 23–25 mm.

Habitat. — Cartwright, Man., Mr. E. Firmstone Heath.

Two males and three females are at hand, all of them of Mr. Heath's collecting and three of them very good examples. The relationship is to *ochreipennis*; but the species is smaller, different in color, the lines differ somewhat in course and the enlargement of the ♂ antenna is made up in a different way — a character that must be figured rather than described.

DESCRIPTIONS OF NEW AMERICAN MOTHS.

BY HARRISON G. DYAR, A.M., PH.D.,

WASHINGTON, D. C.

Family COCHLIDIIDÆ.

Genus SEMYRA Walker.

Semyra marizæ, new species.

Dark blackish brown. Fore wings heavily obscured, without lighter areas, but the terminal portion beyond the line of a more purplish luster. Line faint, fine, bluish, from beyond middle of inner margin, slightly bent inward, running to the costal-subapical mark, which consists of a small dark brown spot, nearly surrounded by a bluish halo. Submedian space basally reddish with a slightly raised dot. Hind wings brown, considerably lighter over disk to base. Expanse, 27 mm.

One ♂, St. Laurent, Maroni River, French Guiana (Wm. Schaus).

Type no. 9132, U. S. National Museum.

Named in honor of Miss Mary Hudson of Plattsburgh, New York.

The species is allied to *S. distincta* Möschl., and I have considered the possibility of its being the male of that species; but none of the species of *Semyra* are sexually dimorphic, so I have decided that it is more probably distinct. The lines are placed as in *distincta*, but the apical part of the marking is obliterated.

Family PYRALIDÆ.

Subfamily PHYCITINÆ.

Genus MYELOIS Hübner.

Myelois glendella, new species.

Light gray, the lines black except the subbasal blotch which is olivaceous. Wing whitish, thickly dusted with black scales. Inner line broad, straight, distinctly oblique, edged with whitish within; an olivaceous gray half band before it on

inner margin; discal dots conjoined, diffused; outer line slightly bent inward in sub-costal and submedian interspaces, slightly dentate, followed by a whitish edge, beyond which is a faint subterminal gray line. Black dots on the termen. Hind wings pale grayish. Expanse, 22 to 23 mm.

Two ♂, Glenwood Springs, Colorado (Dr. Wm. Barnes), one of the specimens in Dr. Barnes's collection.

Type no. 9100, U. S. National Museum.

Genus ZOPHODIA Hübner.

Zophodia polingella, new species.

Similar to *Z. glaucatella* Hulst, but much larger and the outer line more incised. Light gray, whitish on costal half, inner margin between the lines strongly shaded with fuscous to median vein. Lines faint, black, the inner line bent at an angle on median vein, the outer incised subapically, supplemented by a black triangle on costa. Discal dot single, large, sublunate. Hind wing white. Thorax gray with a black posterior band. Expanse, 26 to 32 mm.

One ♂, one ♀, Southern Arizona, April 1-15 (Poling). The ♀ is in the collection of Dr. Barnes.

Type no. 9101, U. S. National Museum.

Genus POUJADIA Ragonot.

Poujadia pimella, new species.

Palpi long, sickle-shaped, obliquely upturned, three times as long as the head. Fore wings with 11 veins, 4 and 5 stalked; hind wings with 7 veins. Fore wings flesh colored, the costa broadly dark gray; gray scales scattered on all the veins; a white ray along median vein, running out on the stalk of veins 4 and 5. Hind wings grayish, fringe pale. Expanse 24 mm.

Two ♂, Babaquivera Mts., Arizona, Pima County (Wm. Barnes). One type is in Dr. Barnes's collection.

Type no. 9102, U. S. National Museum.

Genus OLLIA Dyar.

Ollia parvella, new species.

Costal half of fore wing white with slight darker lines on the veins toward apex. Inner half pale ochreous, shading to gray next to white part. Hind wing whitish. Expanse, 12 mm.

Six ♀, Brownsville, Texas, May 31 to June 9, 1904 (H. S. Barber).

Type no. 9103, U. S. National Museum.

Without the ♂ the generic position is in some doubt, but lies between *Ollia* in which the male antennæ are simple and shortly pectinated, and *Pectinigeræ* Ragonot (= *Cayuga* Hulst), in which they are modified at base by a scale tuft.

Class I, HEXAPODA.

Order XI, ORTHOPTERA.

THE CYRTOPHYLLI OF THE UNITED STATES.

By A. N. CAUDELL,

WASHINGTON, D. C.

(PLATE I.)

The members of the group Cyrtophylli, generally known as true Katyids, are rarely numerously represented in collections, though at times they are rather common in some localities. The nights may resound with the song of the males and yet the listener never see one of the songsters. This is accounted for by the habitat of the insect, which is in the tallest trees available. In the vicinity of Washington they live in tall trees in the woods, thus escaping notice by the greater number of people. In some localities they are numerous and, in the absence of large trees, live in orchards and shrubbery. In such localities they are no rarity to the farmer or fruit grower but in places where large trees abound one may live a life time and rarely see one, though often hearing the stridulations of the male. The sound made by these insects is the loudest made by any orthopterous songster known, being indeed, unsurpassed by any insect of any order except the Cicada, or harvest fly. The song of the common species, *perspicillatus*, consists of a rasping note repeated from two to five times, usually three, followed by a short pause. The same species seems to vary its song from time to time, sometimes the note being repeated but twice and again as many as five times, the number probably depending upon the vigor of the insect as well as upon the temperature. The number is said to vary quite regularly in the number of beats per minute according to whether the temperature is higher or lower. The number per minute at a temperature of 82° is said to be about 89 while at 58° it is but 15 to 20. The notes have a fancied resemblance to the words "Katydid," or "Katy-did, she-did."

The female of these insects, at least that of the common species, *perspicillatus*, is unique among Orthopterous insects, so far as known, in that they stridulate in a manner similar to that of the males. The elytra are partially opened and closed just as are those of the males during stridulation. The roughened surface of the triangular anal

areas rub over each other, like the tympani of the males, the right elytron sliding beneath the left one. The resulting sound is a sharp scraping note heard easily for several yards. This sound is made by the female when disturbed by handling but whether or not it is ever made voluntarily in nature is not known, but it presumably is when the insect is disturbed by any cause. Not enough study has been given the various species of these interesting insects in nature to admit of their separation on song and habit. But little is recorded regarding their breeding habits. Jaeger, *Life of North American Insects*, p. 108, says the female oviposits in the soil but his observations, which are also given by Lord in *Science Gossip* for July, 1865, must have been faulty as the eggs are quite surely deposited in crevices in the bark of trees. Professor Riley secured eggs from a female in captivity. They were inserted into a piece of cork and some into crannies in the breeding cage. On October first of last year Mr. Barber secured a female of *perspicillatus* ovipositing by night on Plummers Island, Md. The ovipositor was inserted into the bark of a small Elm tree a few feet above the ground. This is probably not the usual place of oviposition, the eggs more likely being inserted into the bark of large trees some considerable distance from the ground. The young feed on the leaves and very probably rarely or never leave the shelter of the tree upon which they were born. They mature in July and live till killed by the coming of cold weather. In the vicinity of Washington the males commence stridulating in the latter part of July and continue till about the first of October, rarely later.

The song is heard from dark to nearly daylight throughout August and well into September. But as the nights grow cooler they stop earlier and the survivors that live to sound their note after the middle of October rarely do so at night, the notes being feeble and made during the afternoon. Mr. Barber has heard the note of *perspicillatus* as late as the first week in November. But evidently very few individuals live that late in the latitude of Washington.

Considerable doubt exists as to whether or not these insects ever fly. I have repeatedly endeavored to persuade specimens to fly, but without success. Both Mr. Barber and I have succeeded in getting specimens to spread the wings and sail to the ground, alighting with a thud, but no attempt was made by the insects towards actual flight. They probably soar from one tree to another after the manner of the flying-squirrel. They may also at times actually fly as Mr. McAtee

claims to have seen a "katy-did with round wings" flying about the tops of tall trees on Plummerville Island, Maryland. The elytra were held rigid while the insect was in flight, like those of *Colcoptera*. But, being at such a height above the observer, accurate observations were necessarily difficult and error may have resulted.

Five nominal species of this group have been recorded from the United States, *C. perspicillatus* Fabr., *concaus* Harr., *zimmermanni* Sauss., *hypericifolius* Stoll, and *floridensis* Beutenm. Eliminating certain of these through synonymy or being erroneously referred to our fauna and adding three new species we have six species referable to three genera. These genera may be separated as follows:

Pronotum scarcely longer than the middle width, the lateral lobes quadrate or higher than long; supraanal plate of the female no more than twice as long as the middle width, apically broadly rounded or subtruncate.

Anterior tibiae spined above; pronotum subtruncate posteriorly, the lateral carinae subsistent; posterior femora with about ten spines below on the outer carina; supraanal plate of both sexes convex above on the basal two thirds and longitudinally sulcate; cerci of male with the branches parallel, the tips no farther apart than the length of the lower branch.....**Paracyrtophyllus.**

Anterior tibiae unarmed above; pronotum posteriorly rounded or subangulate, the lateral carinae not indicated anterior of the principal sulcus; posterior femora with about five or six spines on the outer carina below; supraanal plate of both sexes concave above on the basal fourth only or nearly wholly flat; cerci of the male with the branches divergent, the tips further separated than the length of the lower branch.....**Cyrtophyllus.**

Pronotum considerably longer than the middle breadth, the lateral lobes decidedly longer than high; supraanal plate of the female more than twice as long as the middle width, apically narrowly rounded.....**Lea.**

Genus PARACYRTOPHYLLUS, new.

Color green. Head short, broad; interocular space about four times as broad as one of the eyes; vertex dorsally sulcate, very narrow, about one half as broad basally as one of the eyes, acute with the sides straight. Antennae long and slender, nearly twice as long as the body, including the wings, the basal segment much enlarged; antennary scrobes laminate on the inner side, as long as the vertex; eyes subglobose, small but prominent. Prothorax short, broad and stout, the disk granulous or rugose, nearly flat and crosses by two transverse sulci, usually fairly distinct but sometimes more faint, the posterior one generally the more distinct and situated about the middle, the anterior one, sometimes quite indistinct, cutting the anterior half about the middle; posterior margin of the pronotal disk subtruncate; lateral lobes vertical, subquadrate or slightly higher than broad, the lower and anterior margins straight, the posterior margin straight below, inclining slightly backwards above; lateral carinae persistent, usually obscured near the anterior border of the pronotum; pro-, meso- and metasterni each armed with a pair of quite long sharp spines, those of the

prosternum cylindrical, the others more or less triangular. Abdomen heavy, one of the segments near the base tuberculate above in the male and the penultimate segment in the same sex is very broad and somewhat flaring; supraanal plate convex and longitudinally sulcate above on at least the basal two thirds, but little longer than broad in either sex, apically broadly rounded, sometimes subtruncate; subgenital plate of the male prominently produced as a long flattened slightly tapering blade, dorsally concave and cleft in the apical third, the two branches more or less connate. Ovipositor a broad slightly curved blade, about two times as long as the pronotum, slightly broadened mesially and apically quite abruptly pointed, subapically armed on each side with two or three short transverse ridges and very finely and dully serrate below on the apical fourth or less; the central portion of the ovipositor is so thin as to be translucent but the tip and both margins are thickened and opaque. Cerci of female rounded, pointed, the tips obscurely and briefly furcate; of male angular and forked, the branches parallel (Fig. 6). Elytra very broad, and usually convex giving the insect a very rotund appearance, the basal half or more of the costal area in the male is subhyaline with conspicuous parallel transverse veins and the speculum is exceedingly well developed (Fig. 1); wings ample, considerably shorter than the elytra. Legs slender, weak; anterior tibiae with slit-like foramina present on both sides, hind femora about three and one half times as long as the pronotum, moderately swollen on the basal half or three fifths, armed below on the outer carina with ten short stout spines; middle and anterior femora armed on both margins below with several spines on the outer carinae of the middle ones and the inner carinae of the anterior ones * the opposite carinae with but three or four spines, sometimes but one or two. Tibiae flattened above with acute margins, the anterior pair armed above on the outer carina with half a dozen stout spines, none apical, the inner carina unarmed or with but one or two minute spines; middle and posterior tibiae armed above and below on both sides with a number of spines.

Type: *P. robustus* Caudell.

The description of this genus has been made in full as those of the following ones are somewhat comparative with it.

The measurements given in this paper are made as follows: Width of elytra is at the widest point. Length of the ovipositor, and of the subgenital plate of the male the measurement is from the extreme ventral base direct to the tip. Width of the subgenital plate of the male is the width at the widest point of that portion projecting beyond the tip of the body. Width of the pronotum is the width at the broadest point, always across the posterior part. Width of ovipositor is the width at the widest point beyond the body.

* In descriptive entomology confusion is liable when mention of the outer or inner side of the anterior legs is made, when in a natural position the inner side of the anterior femur is really the outer side when corellately considered. For the sake of convenience the legs are always considered as being in a natural position when being described, that is the posterior and intermediate ones directed backwards and the anterior ones directed forwards.

Paracyrtophyllus robustus, new species (Pl. I, figs. 1 and 6).

Robust; thorax heavy and broad, disk flat, considerably elevated in the posterior third, less so in the female; transverse sulci moderately distinct, the anterior one less so; lateral carinae persistent and moderately acute, usually somewhat obscured in front of the anterior transverse sulcus. Elytra about twice as long as broad in the female, in the male about one and one half times as long as broad; wings considerably shorter than the elytra. Supraanal plate of both sexes convex above on the basal two thirds or three fourths and longitudinally sulcate, the apical portion flattened and apically broadly rounded or sometimes subtruncate; subgenital plate of the male longer than the thorax, slightly and gradually tapering, the tip split, the two parts distinct and apically subcompressed; cerci of the female slightly broader than thick, about five times as long as the basal width, somewhat incurved and apically incised; that of the male divided into two long parallel branches, incurved apically, the lower branch with about the apical half bent inwards and backwards (Fig. 6). Ovipositor broad and about two and one half times as long as the length of the thorax.

Length, pronotum, male, 6-7; female, 6-7; elytra, male, 28-29; female, 28-30; posterior femora, male, 22-23; female, 22-25; subgenital plate, male, 13; ovipositor, 17 mm. Width, pronotum, male, 8.5; female, 8-9; elytra, male, 19; female, 14-16; subgenital plate, male, 2.25-2.5; ovipositor, 3.5-3.75 mm.

Type no. 9143, U. S. National Museum.

Five specimens are before me, three males and two females, all from Texas without definite locality except one female, the largest specimen, which is from Tiger Mills. Other specimens are in the Scudder collection at Cambridge, Mass.

The broader thorax with its more distinct lateral carinae, the dorsally armed anterior tibiae and the shorter elytra and wings make this insect easily distinguishable from related forms. The song and habits are very probably similar to those of the species belonging to the following genus. I had thought to construe the *Cyrtophyllus perspicillatus* of Fabr., to be this form but was prohibited from doing so by the pronotum of his species being described as posteriorly rounded, which is not true of this species.

*
Genus CYRTOPHYLLUS Burmeister.

Cyrtophyllus Burm. Handb. Ent., II, 697 (1838).

Superficially closely resembling the previous genus but is readily distinguished from it by the general form, which is less robust, and by the distinctly more elongate elytra. Structurally there are a number of correlated characters separating this genus from its allies. Lateral carinae of the pronotum distinct only behind the principal transverse

sulcus and the posterior margin of the disk is more rounded, or sometimes subangulate. The anterior tibiae are unarmed above and the posterior femora are armed below on the outer carina with but four or five spines, rarely six or seven. Supraanal plate in both sexes flat and nonsulcate above or convex and longitudinally sulcate only on the basal fourth or less. Cerci of the male with the forks divergent, the tips separated by a distance greater than the length of the lower branch. Ovipositor more than twice as long as the pronotum.

Type: *Locusta perspicillata* Fabricius.

The distinctness of this genus from the preceding one is undoubted, the separating characters being ample to make easy the differentiation of the two genera. Besides the characters enumerated above the subgenital plate of the male is differently shaped, being more hastate in *Cyrtophyllus*. The supraanal plate of the male of this genus is also different, being about as broad as long, while in *Paracyrtophyllus* it is longer than broad.

Brunner (Mon. Pseudophylliden) considers the genus *Chlorocælus* of Bates a synonym of this genus. I very much doubt the correctness of this view as the insect described by Bates does not seem congeneric with the insect typical of *Cyrtophyllus*.

We have four species belonging to this genus. They may be separated by the following table:

Cerci of the male with the lower branch simple.

Lower branch of the cerci of the male with the incurving apical portion scarcely as long as the less tapering basal portion; the cerci between the two branches less enlarged (Fig. 7); elytra of the female broadly rounded apically and the posterior margin usually as convex as the costal margin (Fig. 3).

Larger; transverse sulci of the pronotum distinct, usually quite conspicuous; elytra of the female less elongate than in the alternating category.

perspicillatus.

Smaller; transverse sulci of the pronotum less distinct, usually inconspicuous; elytra of the female distinctly more elongate than in the alternate category.....

elongatus.

Lower branch of the cerci of the male with the incurving apical portion as long as the thick, uniformly tapering basal portion, the cerci between the two branches much enlarged, forming a triangular projection (Fig. 8); elytra of the female narrowly rounded apically, the posterior margin almost straight (Fig. 2).....

intermedius.

Cerci of the male with the lower branch conspicuously forked (Fig. 9).....

furcatus.

Cyrtophyllus perspicillatus Fabricius (Pl. I, Figs. 3, 4, 7).

Locusta perspicillata Fabr., Ent. Syst., II, 36 (1793).

Cyrtophyllus perspicillatus Burm., Handb. Ent., ii, 697 (1838).

Pterophylla concava Harr., Encycl. Americana, viii, 42 (1835).

Cyrtophyllus zimmermanni Sauss., Rev. Mag. Zool., 1859, 206 (1859).

Cyrtophyllus concavus Scudd., Journ. Bost. Soc. Nat. Hist., 1862, 272 (1862).

Considerably less robust than *Paracyrtophyllus robustus*. Thorax usually a little longer than broad, sometimes quadrate, the disk transversely convex, longitudinally flat or sometimes considerably elevated posteriorly; the anterior margin straight, the posterior margin rounded or subangulate; transverse sulci, at least the anterior one, very distinct and well defined; lateral carinae indicated only behind the principal sulcus and there usually quite rounded. Elytra broad and strongly concave, of the same structure as those of *P. robustus* but more elongate than those of that species, those of the female being about two and one half times as long as broad; wings ample, not as long as the elytra, but considerably longer than those of *P. robustus*. Supraanal plate of both sexes somewhat longer than broad, flat or nonsulcate or convex and longitudinally sulcate only in the basal fourth or little more, often more distinctly so in the female, apically broadly rounded or subtruncate; subgenital plate of the male two or more times as long as the pronotum, the projecting portion somewhat hastate, the two halves of the divided apex generally more or less connate; cerci of female round, six or seven times as long as the basal breadth and slightly curved upwards, the tip usually very inconspicuously notched; cerci of the male forked, the two branches divergent and incurved, the lower branch simple, with a minute subapical denticle on the lower side and usually a little shorter than the upper one, the incurving apical portion not quite as long as the scarcely tapering basal portion. Ovipositor three or more times as long as the pronotum, microscopically serrate below near the tip, the serrations sometimes very inconspicuous, armed laterally, as in *P. robustus*, with two or three short transverse subapical ridges.

Length, pronotum, male, 5.5-6; female, 5.5-6; elytra, male, 35-38; female, 37; posterior femora, male, 20-21.5; female, 20-23; subgenital plate, male, 12-14.5; ovipositor, 18-20 mm.; width, pronotum, male, 6-6.5; female, 6.25-6.5; elytra, male, 18-21, female, 16; subgenital plate, male, 2.5-2.75; ovipositor, 3.25 mm.

This species extends south to South Carolina, west to Kansas and north into Canada. I have specimens before me from Massachusetts, New York, New Jersey, Maryland, District of Columbia, North Carolina, Missouri, Kansas and Iowa.

There are a number of minor variations present in the structure of this and the following species. The tip of the upper branch of the cerci of the male is sometimes simply acute and sometimes with the point subapical. The ventral subapical denticle of the lower branch is sometimes obsolete and there is a little variation in the shape of the elytra, of the posterior border of the pronotum and in the dis-

tinctness of the transverse sulci of the thorax. Were all these minor points of difference considered the number of species would be undesirably multiplied.

The *C. zimmermanni* of Saussure is placed as a synonym of this species with considerable certainty. The posteriorly angulate pronotum prohibits its being *P. robustus* and the oval elytra of the female indicates its identity with *perspicillatus* rather than with any of the following species. The correctness of this conclusion is also indicated by the pronotum being described as rugose, a condition more obvious in *perspicillatus* than in the other species. The habitat, however, is more southern than common with *concausus* and an examination of the type might show it to belong elsewhere. But according to the only evidence available, that of the printed description, it is most appropriately placed here.

Gryllus perspicillatus of Linnæus, Amœn. Acad. vi, 398 (1763), which has been referred here by Scudder, does not belong to this group at all. It is, so far as I know, an unidentifiable nymph and is referred to by Fabricius in the same work in which the insect now under discussion was described.

C. hypericifolia Stoll, which was described from Surinam, has been referred to the synonymy under *perspicillatus*, but probably erroneously so, as it is scarcely likely that a species from Surinam would extend into our region. However the locality may have been wrongly given in Stoll's description, in which case his species may well be referred here, as the figure or description presents no discordant features.

This species is better known than any other member of the group and yet comparatively little is known of it, except as regards its song. Many writers have written accounts, poetic and otherwise, of the song of the katydid. The number of notes are said to bear a certain relation to the temperature, as previously mentioned.

All that is known of the breeding habits of this species has been previously discussed. Harris, Ins. Inj. to Vegetation, has described the eggs of *Microcentrum* as those of this species. Riley, Missouri Report, v, p. 123, describes the true eggs as follows:

“.25-.30 inches long, very flat, over thrice as long as wide, pointed at each end, with the edges beveled off or emarginate. They are of a dark slate-color and are thrust into crevices and into the softer parts of bark or of stems. The lower or first inserted end is protected by a dark adhesive substance, which hardens and sometimes extends the whole length of one of the borders; and several eggs are usually pressed close to each other.”

Perspicillatus is not a rare insect in certain localities in the vicinity of Washington. On Plummer's Island, Md., some miles above the city, it is one of the many insect musicians which make a night spent there so enjoyable. This island, the site of the club house of the 'Washington Biological Field Club,' is one of the most primitive regions within reach of Washington. On the island are many large chestnut trees and in these trees live the katydids, which, with the aid of numerous other orthopterous musicians, make the August night one long dream of blended melody. A midsummer night spent with congenial spirits in the club house on Plummer's Island is a pleasant experience not easily forgotten.

***Cyrtophyllus elongatus*, new species.**

Very closely allied to the preceding species but usually distinguishable with considerable certainty by the smaller size and especially by the much more elongate elytra of the female. The smaller size and more elongate elytra of the females give them a decidedly more slender appearance than seen in any other species of the group. The elytra are variable in shape, sometimes having the posterior border nearly straight and sometimes quite as convex as the costal margin.

Length, pronotum, male, 5; female, 5-5.75; elytra, male, 33-34; female, 32-38; posterior femora, male, 17-20; female, 19-20.5; subgenital plate, male, 12-13.5; ovipositor 16-18; width, pronotum, male, 5.5; female, 5.5-6; elytra, male, 18-18.5; female, 13.5-16; subgenital plate, male, 2.25-2.5; ovipositor, 3-3.5 mm.

Type number 9135 U. S. National Museum.

Four males, seven females from Pennsylvania, Virginia, Indiana and Texas. Type male and female from Crawford and Fountain Counties, Indiana, August. (W. S. Blatchley.)

This species, as seen from the above mentioned localities, occupies about the same territory as the preceding species, extending however a little further south. But *perspicillatus* will probably be found to occur in the gulf states also.

Mr. D. Clemmons took a male specimen of this species on Piney Branch, D. C. It was stridulating, and he says the notes were sharper and more brisk than those of *perspicillatus*. I have found the females at Falls Church, Virginia, in late October, where they were killed by frost and had dropped to the ground. A female of *perspicillatus* was found under similar circumstances on Plummer's Island by Mr. H. S. Barber on October 17 of last year.

Cyrtophyllus furcatus, new species. (Pl. I, fig. 9.)

Male only known. Practically indistinguishable from *C. perspicillatus* except by the cerci, which are remarkably different. The lower branch is scarcely at all incurved apically and is without a ventral subapical denticle but is armed about the middle on the inner side with a black-tipped branch about as long as that portion of the cercus beyond it. The two branches are also somewhat more divergent.

Length, pronotum, 6; elytra, 37; posterior femora, 21.5; subgenital plate, 17; width, pronotum, 6.5; elytra, 18.5; subgenital plate, 2.75 mm.

Type no. 9136 U. S. National Museum.

One male, West Point, Nebraska.

The very unusual structure of the cerci of this form makes it quite inadvisable to consider it other than a valid species. The color is reddish brown rather than green, but this is evidently due to discoloration as the same is true of some specimens of other species.

Cyrtophyllus intermedius, new species. (Pl. I, figs. 2, 8.)

Somewhat allied to both *perspicillatus* and *elongatus*, to the former by the longer posterior femoræ and more nearly to the latter by the smaller size, the indistinct transverse sulci of pronotum and the narrow elytra of the female. The cerci of the male are different from those of either of the allied species, the lower branch being shorter, with the apical incurved portion about as long as the basal portion, which is thick and uniformly tapering; the cerci between the upper and lower branches is much enlarged, more so than in any other species seen, forming a triangular lobe (Fig. 8). The elytra of the single female specimen seen are peculiar in having the posterior margin, when the elytron is spread, nearly straight, the tip narrowly rounded (Fig. 2). The transverse sulci of the pronotum are shallow and obscure.

Length, pronotum, male, 5; female, 5.5; elytra, male, 34; female, 35.5; posterior femora, male, 21; female, 21.5; subgenital plate, male, 13; ovipositor, 18; width, pronotum, male, 6; female, 6; elytra, male, 18; female, 14; subgenital plate, male, 2.25; ovipositor, 3.25 mm.

Type no. 9137, U. S. National Museum.

One male, Biloxi, Mississippi (Alice Tracy); one female, Wellsboro, Texas (N. Banks). July 18, 1903.

This seems to be a southern species. It appears unquestionably distinct, not being referable to either of the allied species. The female is especially closely allied to some of the females of *C. oblongatus* in which the anal margin of the elytra is less convex than the costal margin. The elytra of this species must be spread to properly exhibit the shape, the straight anal margin not being obvious when the elytra are folded.

Genus LEA, new.

Color green with brown or yellowish tints. Form more elongate than usual in the other United States genera. Vertex as in *Cyrtophyllus* but the head is narrower. Pronotum about one and one half times as long as the middle width, twice as long as the interior width; lateral lobes one and one half times as long as high and meeting the disk in a distinct angle, forming subpersistent lateral carinae, the disk somewhat rugose and crossed by two distinct, but not conspicuous, sulci, the posterior one a little behind the middle. Legs about as in *Cyrtophyllus*, all the femorae and tibiae spined below and the middle and posterior tibiae above, the anterior ones unarmed dorsally but, like the rest, is flat, with acute margins. Elytra two and one half times as long as the middle breadth, both margins equally curved, apically broadly rounded, the anterior field with the veins regular and parallel as in *Cyrtophyllus*; wings broad, about as in *Cyrtophyllus*. Supraanal plate, at least of the female, slightly more than twice as long as the middle breadth, apically narrowly rounded. Cerci of the male furcate, the branches round and simple, parallel and subequal in length; of female cylindrical, apically pointed and briefly bifid, forming two minute brief branches: subgenital plate of the male similar to that of the allied genera but is more distinctly furcate apically, the two halves more distinctly separated. Ovipositor essentially as in *Cyrtophyllus*, but curving somewhat more abruptly upwards.

Type *Cyrtophyllus floridensis* Beutenm.

This genus, while related to its allies, has a very distinctive appearance. The elongate pronotum with its subpersistent lateral carinae and elongate lateral lobes and the generally more elongate form easily distinguish it from the two allied genera. It is much more nearly allied to *Cyrtophyllus* than it is to *Paracyrtophyllus*, as exemplified by the shape of the wings and the dorsally unspined anterior tibiae; the shape of the cerci of the male however, as shown in the figure, seems to be more like that of *Cyrtophyllus*. All the male characters of the above description were taken from the printed description and figure referred to below. We have but one species:

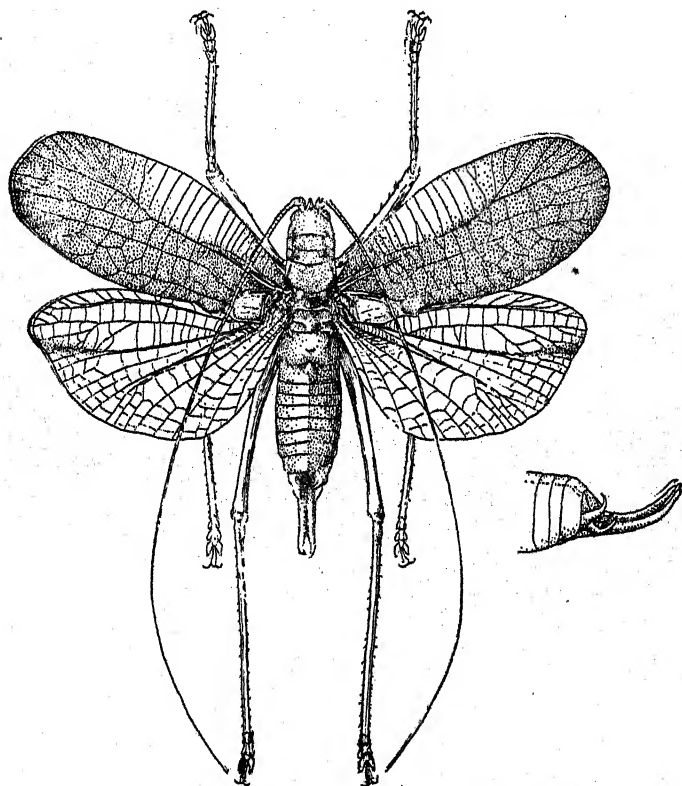
***Lea floridensis* Beutenmueller.** (Text fig. and Pl. I, fig. 5.)

Cyrtophyllus floridensis Beutenm., Bull. American Mus. Nat. Hist., xix, 637, fig. 3 (1903).

The single male, the type, is the only specimen of that sex known. It is described by the author as follows: "Color — Head and thorax light gray, with a tinge of green. Wing-cases green-gray. Legs greenish, basal half of femora pinkish. Head large, stout; eyes hemispherical, rather small. Vertex with a short spine, rounded at the tip, grooved on top. Antennae twice as long as the body. Pronotum longer than broad on top, with two transverse furrows; lateral carinae rounded to the second transverse furrow, thence rather sharply defined to the hind edge; lateral lobes a little narrower at the lower part than at upper; anterior angle acutely rounded; hind angle well rounded. Wings concave. Wing-covers longer than the hind wings, almost three times as long as broad, and almost of equal width; apex

rounded. Legs very long, spinulate. Subanal plate very long, curved upwards, grooved above and below, furcate at the tip. Abdomen with a prominent spine on top of the second segment. Stridulating organs similar to those of *Cyrtophyllus perspicillatus*.

Measurements.—Length of body 43 mm. Length of wing-covers, 37 mm.; width, 13 mm. Length of pronotum on top, 8 mm. Length of anterior femora, 17 mm.; middle femora, 15 mm.; pos-



Lea floridensis Beut. ♂. (After Beutenmüller.)

terior femora, 28 mm. Length of anterior tibia, 15 mm.; middle tibia, 14 mm.; posterior tibia, 30 mm.

Habitat.—Indian River (opposite Grant), Florida.

Described from a single male taken in July. Type, coll. Am. Mus. Nat. Hist.

One female from Florida, undated and without specific locality, is before me. It may be described as follows: Color green with head, thorax, legs and part of the elytra more or less yellowish brown, the disk of the pronotum, next the rounded subsistent lateral carinae, reddish: when living the insect is probably for the most part green, at least the elytra. Pronotum straight above, roughened, the disk twice as long as the anterior width, crossed at the anterior third by an inconspicuous straight sulcus and just behind the middle with a posteriorly bowed sulcus, a little more distinct than the anterior one (Fig. 5). Elytra equally rounded before and behind, the tip broadly rounded, the whole two and one half times as long as broad, the veins of the anterior field weak; legs moderately stout.

Posterior femora armed below on the outer carinae with seven or eight spines, and the middle ones anteriorly with five spines; anterior femora armed below on the inner side only with five spines. All the tibiae armed below with a number of spines on both margins, the posterior and intermediate ones also armed above for nearly the entire length, the posterior ones on both margins and the intermediate ones only on the inner; anterior tibiae unarmed above. Supraanal plate thin and flat, more than twice as long as the middle width and apically somewhat narrowly rounded. Cerci cylindrical, curving gently inwards and upwards, not quite extending to the tip of the supraanal plate and apically tapering and briefly forked, forming two pointed apical teeth; ovipositor of the general form found in *Cyrtophyllus* but curving somewhat more abruptly upwards, apically serrate below, the serrations very fine.

Length, pronotum, 7.25; anterior femora, 13; hind femora, 25; elytra, 34; ovipositor, 17; width, pronotum, 6; at the anterior margin, 3.25; elytra, 13.5; ovipositor, 3.25 mm.

This species is said by Mr. Beutenmueller to live in the tops of live-oak. He says the note of the male is a continuous "Kerr-kerr-kerr-kerr" with about one second interval of rest. It is not rare on the subtropical strip of land dividing the mainland of eastern Florida from the Ocean. It is not at all allied to the *Cyrtophyllus crepitans* Redt., of the West Indies.

Mr. Rehn has taken a number of this species at Pablo Beach, Fla.

EXPLANATION OF PLATE I.

1. *Paracyrtophyllus robustus* Caud. ♂.
2. *Cyrtophyllus intermedius* Caud. ♀ (elytron).

3. *Cyrtophyllus perspicillatus* Fabr. ♀ (elytron).
 4. *Cyrtophyllus perspicillatus* Fabr. ♂ (head and pronotum).
 5. *Lea floridensis* Beutenm. ♀ (outline of disk of pronotum from above).
 6. *Paracyrtophyllus robustus* Caud. ♂ (cercus, from side).
 7. *Cyrtophyllus perspicillatus* Fabr. ♂ (cercus, from side).
 8. *Cyrtophyllus intermedius* Caud. ♂ (cercus, from side).
 9. *Cyrtophyllus furcatus* Caud. ♂ (cercus, from side).
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Class I, HEXAPODA.

Order XIII, MALLOPHAGA.

MALLOPHAGA FROM ARGENTINA.

BY VERNON L. KELLOGG,

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(PLATE II.)

A small lot of Mallophaga taken from birds of Argentina (South America) was sent me in 1902 by Dr. Carlos Berg, of Buenos Aires. In recently going over this lot I find it to consist of the following nine species, of which seven at least are new and are described and figured herewith.

Eurymetopus taurus Nitzsch.

Several specimens from *Diomedea regia*.

Goniodes sp.?

Two specimens of a large and unusual species of *Goniodes*, without any host reference.

Lipeurus bergi, new species (Pl. ii, Fig. 1).

Males, females and young from *Guira guira* (Argentina).

Description of Female. — Body, length 2.7 mm., width .55 mm.; slender; strongly marked with light brown regular blotches and bands.

Head, length .55 mm., width .4 mm.; elongate, conical, with rather narrow clypeal front which is very weakly concave; two hairs in anterior angles and other short ones on lateral margins near trabeculae; trabeculae colorless; eyes prominent, with black pigment and a prickly; temporal margin convex, with two long hairs and two spines; occipital margin nearly straight, with two spines along posterior angles; signature transparent; ground color pale brown; antennae and occipital bands brown, temporal margin dark brown, two brown spots along occipital margin between the occipital bands.

Prothorax almost square, with posterior margin very slightly angulated on the metathorax; one long hair on each posterior angle; transparent in middle, with dark

brown lateral margins. Metathorax a little longer than wide, sides diverging, posterior angle rounded; posterior margin with three long pustulated hairs and one small hair at the posterior angle. Legs large, slender, dark brown markings on the margin.

Abdomen elongate with two or three long hairs in posterior angle of each segment; segment 4 widest, segment 5 slightly narrower than 4, and segments 7 to 9 narrowing more rapidly; segment 9 deeply angularly emarginated, the points acute, and bearing many fine curved hairs on the inner margin; narrow marginal dark brown bands and two quadrangular lateral blotches on each segment, each blotch with a clear stigmal spot in center; the blotches distinctly separated from each other and from the lateral submarginal uncolored space.

Male. — Body, length 1.7 mm., width .37 mm., head, length .6 mm., width a little over .3 mm. General color very much lighter than that in the female; first antennal segment longer than second, third, fourth and fifth together; abdomen with parallel sides; legs remarkably large.

***Lepeurus argentinus*, new species** (Pl. ii, Fig. 2).

Females from *Plegadis guarana* (Argentina).

Description of Female. — Body, length 2.5 mm., width .33 mm.; very elongate and slender; parallel-sided; color, very pale with margins of head between antennae and sutures golden yellow; thorax and abdomen with pale yellow markings.

Head, length .5 mm., width .36 mm.; elongate conical, with clypeus expanded; one lateral hair on expanded clypeal portion, one long hair in front of the suture, one at the suture, and two rather weak hairs between antenna and suture; trabeculae small, transparent; temporal margins slightly convex, with four or more short spine-like hairs; occipital margin nearly straight with two hairs in posterior angle; eyes conspicuous with black pigment; antennae with second segment longest, fifth next to longest, segment 4 shortest, segments 1, 3, and 4 are subequal; clypeal signature shield-shaped, extending to front margin of head, pale brown, with distinct suture extending from posterior angle along the median line not quite to the anterior margin of signature; antennal bands golden brown, distinct; temporal margin pale yellow; occipital margin uncolored.

Prothorax almost square; posterior margin nearly straight, with three spines in posterior angles; lateral margins pale yellow. Metathorax quadrangular, longer than broad, slightly narrowing anteriorly; posterior margin straight, with five long and one short hairs in each posterior angle; lateral margin pale yellow. Legs large, pale yellowish markings on the margin.

Abdomen elongate; first segment slightly narrower than thorax at articulation, segments gradually widening to the fifth and narrowing from there to the ninth; segments 1 to 8 with four hairs on dorsal surface near posterior margin; segments 1 to 7 with one weak hair in posterior angles, segments 8 and 9 with two long and one short hairs; segment 9 with rounding emargination on posterior margin; segments 1 to 9 with very pale narrow marginal bands, and two quadrangular pale yellow blotches separated from each other and from lateral band by uncolored space.

***Goniocotes abnormis*, new species** (Pl. ii, Fig. 3).

Males and females from *Ava chloroptera* (Argentina).

Description of Female. — Body, length 1.75 mm., width .55 mm.; pale with

dark brown markings; temporal margin rounded instead of angulated as usual in this genus.

Head, length .4 mm., width .47 mm.; front narrow, rounded, with eight spines; antennæ in shallow emargination with first segment stout and longest, second segment almost as long as first, third, fourth and fifth subequal; temporal margin flatly rounded with one long hair and four prickles; occipital margin concave in middle, with two spines and one long hair in the posterior angle; pale yellow with golden yellow narrow marginal frontal bands ending posteriorly on each side in an expanded dark brown spot inside of antennal emargination; mandibles and oesophageal sclerite dark brown; eyes flatly convex with two spines; an irregular, brown ocular blotch behind the eyes.

Prothorax very narrow, about one half of the width of the head, almost quadrangular; posterior margin flatly convex; one long hair in posterior angle; posterior angles dark brown. Metathorax with blunt lateral angles, each middle of lateral margin with one spine; posterior angles with two hairs; posterior margin obtusely angled on abdomen, and bearing six long hairs. Legs rather small, pale; claws pale brown.

Abdomen elongate elliptical, segments 1 to 4 with one short hair in posterior angles, segments 5 to 8 with two long hairs in posterior angles; dorsal surface with four long hairs in transverse series on each segment near posterior margin; ground color whitish with distinct narrow lateral bands, darkest on anterior segments, distinct transverse blotches, each, with a clear stigmatal spot in center, in segment 1 to 7 are separated by a transparent white median space; segment 8 wholly colored, segment 9 with very weak rounding emargination on posterior margin.

Male. — Body, length 1.3 mm., width .5 mm.; head, length .33 mm., width .43 mm., first antennal segment very large; abdomen broadest at segment 5; elongate-oval; segments 1 to 7 with entire transversal abdominal bands, segments 8 and 9 wholly colored; genitalia distinct, barely chitinated, dark brown in color.

Colpocephalum guirænsis, new species (Pl. ii, Fig. 4).

Males and females from *Guira guira* (Argentina).

Description of Female. — Body, length 2.7 mm., width 1 mm.; pale yellow with brown border on the thorax; prothorax small.

Head, length .41 mm., width .73 mm., semilunar with flatly-rounded front, shallow ocular emarginations, and rounded posterior angles; occipital margin concave; palpi projecting by the length of the last segment, the antennæ when out-stretched also projecting beyond the margin of head by the length of the last segment; two pairs of spines in the middle of front, one short hair on side followed by two long ones; the ocular fringe composed of many short prominent hairs; temporal margin with three long and about half a dozen short hairs; occipital margin concave, bare; a small, black ocular fleck; the mandibles black-tipped.

Prothorax small, shorter than broad, lateral angles obtuse, produced, and with a long hair and spines; on rounded posterior margin a row of long hairs; color pale brown with brown lateral borders. Metathorax, sides with many short spines; posterior angles with two strong hairs; posterior margin with a row of spiny hairs, anterior angles brown. Legs, large and concolorous with body.

Abdomen broadly elliptical, one long hair and several spines in each posterior angle, and a series of many short hairs along posterior margin of each segment; color

paler at sutures; ninth segment broadly rounded behind with narrow transparent margin thickly set with a fringe of short, sharp-pointed transparent hairs.

Male. — Body, length 2.5 mm., width .9 mm.; head, length .4 mm., width .73 mm.; abdomen narrower than female; genitalia distinct, projecting chitin bar reaching second segment.

***Colpocephalum burmeisteri*, new species** (Pl. ii, Fig. 5).

Males and females from *Ava chloroptera* (Argentina).

Description of Female. — Body, length 2.2 mm., width 1.3 mm.; slender; well marked with entire transversal abdominal blotches with wide, whitish intersegmental spaces and dark brown, narrow lateral bands.

Head, length .33 mm., width .55 mm.; front flatly rounded, with slight rectangular orbital emargination; about five short hairs on each lateral margin of forehead and two long and three longish hairs in region just in front of orbital emargination; the palpi projecting as also the antennæ; temples narrow, two long hairs and at least four short hairs; occipital margin concave; general color yellowish brown, with narrow blackish occipital border and blackish curving ocular blotches.

Prothorax rather small, wider than long; lateral angles obtuse with three spines; posterior margin, from angle to angle, making a flattened semicircle and bearing eight hairs; general color yellowish brown, regions of lateral angles distinctly darker, transverse chitin band transparent, narrow, with a spine rising from each extremity; curving chitin bands at extremities of the transversal bar distinct, narrow. Metathorax with nearly straight posterior margin, and a series of hairs along the margin; lateral margins with six spines; posterior angles with two hairs and three spines; lateral margin with several spines. Legs rather large with marginal markings.

Abdomen long, slender, widest at segments 2 and 3; segments 1 to 6 with a long hair in the posterior angle, segments 7 to 9 with two or three long hairs; dorsal surface of each segment with a transverse thickset row of uncolored hairs near the posterior margin; all segments with distinct dark brown lateral margin.

Male. — Body, length 1.9 mm., width .55 mm.; head, length .33 mm., width .5 mm.; posterior end of last abdominal segment flatly rounded; genitalia distinct, the long chitin bar extending to the third abdominal segment.

***Lamobothrium caracaraensis*, new species** (Pl. ii, Fig. 6).

Males and females from a Caracara eagle, *Polyborus tharos* (Argentina).

Description of Female. — Body, length 6.5 mm., width 2 mm.; strong and distinct lateral margins and paired median dark brown blotches on abdomen; a finely marked species.

Head, length 1.13 mm., width 1.2 mm., ocular emargination very prominent, front straight; each side of the middle with two long and three short marginal hairs: two strong hairs at the angle; two terminal segments of the palpi projecting beyond lateral margin of the front; temporal margin slightly angulated; eyes double, conspicuous; mandibles brown, with teeth dark brown; distinct dark brown band along posterior and lateral margins.

Prothorax, with distinct lateral angles, in apex of which two long hairs and three spines; two more long hairs and many spines along posterior lateral margins; ground

color pale with dark brown margin and darkish-brown longitudinal blotches separated from each other by a narrow uncolored space. Metathorax longer than wide, lateral margin with many spine-like hairs; a transverse row of pustulated hairs near posterior margin; lateral margin dark brown, two subtriangular blotches separated from each other by a narrow median uncolored line; anterior corners black-brown. Legs very large, distinctly marked.

Abdomen, large, lanceolate in form, one or two long hairs on the postero-lateral angles of each segment; and short hairs along lateral margins; a row of postulated hairs on the posterior margin of each segment; marginal bands dark chestnut brown and two quadrangular blotches narrowly but distinctly separated from each other and more widely from the lateral bands by uncolored space; posterior margin of the last abdominal segment pointed.

Male.—Body, length 5.5 mm., width 1.5 mm.; head, length 1 mm., width 1.05 mm.; abdomen slender than in the female, last segment parabolic in form with several weak hairs along the margin; clear space down the median line separating the abdominal blotches, not so distinct as in the female, and wanting in the last three segments.

Menopon argentinus, new species (Pl. ij, Fig. 7).

Females from *Chrysomitris icterica* (Argentina).

Description of Female.—Body, length 1.2 mm., width .43 mm.; pale yellow, head and thorax slightly darker; abdomen with pale brown transverse blotches.

Head, length .27 mm., width .35 mm.; semilunar with evenly rounding front, shallow ocular emarginations with rounded posterior angle; occipital margin concave; palpi projecting by the length of the last segment; a pair of minute hairs in middle of front, a longer one on side followed by a very short one, and then three long ones in front of the emargination; the ocular fringe composed of rather strong hairs; temporal margin with three long hairs, two more on occipital margin of the produced temples; two long hairs along middle of the occipital margin; a small, black, ocular fleck and dark brown ocular blotch.

Prothorax subquadrangular, posterior margin convex with six longish hairs, and three spines along middle of the lateral margin; latero-posterior corners angulated. Meso- and metathorax fused, although the line of fusion is marked by a lateral emargination and by an indicated transverse suture; posterior angle with one long hair and three spines; the straight posterior margin with four marginal hairs. Legs stout, with dark brown marginal markings.

Abdomen obovate in form, widening posteriorly to segment 3; segment 4 a little narrower than segment 3, and segment 5 and 9 narrowing more rapidly; segments 1 to 7 with two or three long spines on lateral margin; with pale brown lateral bands and very pale transverse blotches.

EXPLANATION OF PLATE II.

FIG. 1. *Lipeurus bergi* Kell.

FIG. 2. *Lipeurus argentinus* Kell.

FIG. 3. *Goniocotes abnormis* Kell.

FIG. 4. *Colpocephalum guiransis* Kell.

FIG. 5. *Colpocephalum burmeisteri* Kell.

FIG. 6. *Lamobothrium caracarasensis* Kell.

FIG. 7. *Menopon argentinus* Kell.

JOURNAL
OF THE
New York Entomological Society.

EDITED BY HARRISON G. DYAR.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

EDITORIAL.

Our criticism of a work by Dr. Henry Skinner (Journ. N. Y. Ent. Soc., xiii, 217, 1905) has brought a rather hysterical reply (Ent. News, xvi, 217, 1905), which we should not notice, except that it attempts a misrepresentation of our Review of the Hesperiidæ (Journ. N. Y. Ent. Soc., xiii, 111, 1905). Dr. Skinner cites two errors. We presume that he is right in both cases; the mistakes can be easily corrected by transferring *manataaqua* to *Thymelicus* and proposing a new name for *Atrytone* Dyar (not Scudder). This does not bear at all upon the question of generic classification, which is the real issue. Dr. Skinner claims to have studied the genera. We fail to see any evidence of it in his remarks, which are actuated only by a consideration of specific values. When Dr. Skinner gives us some original work based on structural characters, we shall begin to believe that his study of genera has been more than an opinionated attempt to discredit them.

To refer to Mr. Prout's remarks in our last issue, advocating the "historical method," or rule of the first reviser in the fixation of generic types, we presume the weakest point in his argument is shown by the phrase "given the literature." The trouble is that the literature is not given. President David Starr Jordan (*Science*, n. s., xxii,

598, 1905) finds further objection to the first reviser rule. He says: "The objection to it is that no one has yet defined the first reviser so as to separate his rights from the rights of different meddlers." Mr. Prout would except faunal lists; but why except anything? The only way to have any definiteness is to include the "meddlers" on the same basis as the "reviser" and take as type the one first mentioned by anybody. This would involve even more of what President Jordan calls "otherwise profitless labor in bibliography" than following the first reviser, for it would mean the examination of all literature for some stray mention of a genus and typical species. No doubt this is asking too much; we fear there is no fixity or uniformity in the "historical method." Lord Walsingham, we believe, has expressed the opinion that a writer should know the literature of his subject. If there were any way of knowing that this desirable condition had been attained, we should cordially endorse the view; but even the best posted author is liable to discover accidentally some overlooked reference that may vitiate his carefully constructed historical system. He is always in a position of uncertainty.

We return to the method of first species as the only one promising fixity. President Jordan says: "The method of beginning with a leading species or *chef de file* as typical representative of each genus, to be described in full while the others were disposed of in comparative sentences, was adopted by Lacépède, Cuvier, Valenciennes, Poey and other authors. In Ichthyology this has given reason for the choice of the type of the genus by page precedence. This method was raised to the dignity of a universal rule by Dr. Bleeker and others. It is a pity it was not adopted earlier, for it would have given fixity, a matter which in nomenclature far outweighs all others." The objections to the method are, we believe, two. The first is that it would change many of the names now in use; the second that Linnæus and others usually placed their typical species in the middle of the series and the less known or aberrant ones at the ends. To obviate these we suggest that in the case of Linnæus and other authors definitely known to have used his method, the *central* species be taken instead of the first. These authors would have to be enumerated in the rule and all others held to the first species as type. But unfortunately, a glance over Linnæus' tenth edition shows that this would be no solution of the problem, for taking the middle species as type is not more in consonance with modern ideas than taking the first. In fact, in the Coleop-

tera, to take the first species uniformly as type would cause considerably less change in the present classification than to take the middle species. In the Lepidoptera, either course would cause a very radical change, about equal in either case. It has been proposed to cite as type of the Linnæan genera the common European species included under each. This is objectionable, because it is not capable of general application, as there are some groups without any common European species and others with two or more.

We are reduced therefore to squarely favor the first species method. Let us make what changes this requires now, which are perhaps not so many, and have the names finally settled on a permanent basis.

BOOK NOTICES.

The International Code of Zoölogical Nomenclature as Applied to Medicine. By CH. WARDELL STILES. Bulletin No. 24 of the Hygienic Laboratory, Treasury Department, Public Health and Marine-Hospital Service of the United States. Washington: Government Printing Office. 1905.

This very important paper presents the international code in available form with explanatory comment by the author, who is well qualified to explain the code, being the secretary of the permanent committee of the International Zoölogical Congress. There are 36 articles and a valuable appendix giving rules for the transcription of Greek words and geographic names to be in Latin form. These rules would be more valuable if there were any obligation in the code itself to respect them, which there is not. Unfortunately the code does not embody the recommendations which we have urged in editorial comment in this Journal and in an article with Mr. Caudell on the types of genera (Journ. N. Y. Ent. Soc., XII, 120, 1904). We object to articles 4, 5, 14, 25 and 30.

Articles 4 and 5 do not go far enough. They state how the family name shall be formed, but do not tell us how to select the type genus. Is it to be the oldest one, or the one first selected historically? When changed, why should the name not go to the next oldest one (as advocated by us), or to the one next used for family type historically, rather than to the substituted name (as advocated by article 5)?

Article 14 states that specific names in adjective form must agree

in gender with the generic name. We object to this. It is perhaps easy to determine the gender of the old classical Latin names, but not so those of Latinized Greek or barbarous generic names. Of these there are already more than the pure Latin names, and we shall have an increasingly larger proportion in the future. We regard it as far simpler to write the specific name exactly as first proposed.

We would note that by article 25 the definition of a genus by citation of type, without description, seems accepted, the rule stating that a name must be published, accompanied by an *indication* or a definition or a description. But, as this applies also to specific names, we object, on the ground that an "indication" is not a sufficient specific description.

Article 30 tells us how to determine the types of genera. This is the most complicated set of recommendations we have seen. Both the methods of elimination are endorsed, although it has been shown that they are contradictory in their results, while the method of first species is not even mentioned. We defy any two workers to arrive at the same type for any complicated genus by using these rules and working independently. If the recommendations and the discussion be cut off, the rule itself is simple enough, being the plain historical method advocated in these pages by Prout. The discussion here only confuses an originally simple proposition; but it serves to show into what shape an apparently simple proposition can be twisted, and is a valuable exposition, we should say, of what not to do.

With these exceptions we find this presentation of this most recent code to be excellent. We infer that the publication is generally available from the statement that it will be sent to "nonpublishing societies and individuals in case sufficient reason can be shown why such societies or individuals should receive it," which statement we find on the cover. Application should be made to the Surgeon General, U. S. Public Health and Marine-Hospital Service, Washington, D. C.

Monograph of the Bombycine Moths of North America, including their transformations and origin of the larval markings and armature. Part II. Family CERATOCAMPIDÆ, Subfamily CERATOCAMPINÆ. By ALPHEUS SPRING PACKARD. *Memoirs of the National Academy of Sciences*, vol. ix, pp. 1-149, plates I-LXI. 1905.

This valuable work gives, in a wealth of detail, the life histories of

our Ceratocampids, together with some South American forms. The work has been completed after Dr. Packard's death, which perhaps accounts for a certain disjointed air and for sundry strange statements, such as one we find in the explanation of plates, where a figure purports to represent the "newly hatched larva in stage V." Dr. Packard has gone extensively into the phylogeny and relationships of the group, and has arrived in many respects at sound results. We find ourselves more in accord with his views than we had anticipated would be the case. We cannot, however, be expected to acquiesce in the impossible derivation of the Citheroniidæ from the Notodontidæ which is set forth. Likewise we dissent from the relationship claimed for the Sphingidæ. Dr. Packard quotes and confirms our statements as to the differences in structure of these groups, yet fails to draw the necessary conclusion that they are unrelated. A full life history of the Sphingid *Ceratomia amyntor* is given. Some new species are described, which must be verified, as we believe Dr. Packard was possessed of but slender South American material. We particularly commend the many beautiful plates drawn by Mr. L. H. Joutel and those photographed by Mr. A. H. Verrill, although, by some misfortune, all the larvæ are represented as resting on the branch *above*, a position that no living larva of this size does, or could possibly maintain. It is with the greatest regret that we realize this to be the last of the Bombycid monographs, as the learned author has passed from among us.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF FEBRUARY 21, 1905.

Held at the American Museum of Natural History.

President C. H. Roberts presided with eight members and three visitors present.

Mr. Barber proposed Mr. Edgar L. Dickerson of Newark, N. J. as an active member of the society.

On motions the by-laws were suspended and the secretary instructed to cast a single ballot in favor of the election of Mr. Dickerson at the present meeting.

The resignations of Mr. G. A. Billings and C. T. Brues as active members were accepted by the society with regrets.

On motion of Mr. Davis the secretary was requested to address letters of sympathy to Mrs. A. S. Packard and Mrs. Annie Trumbull Slosson on behalf of the society.

The librarian, Mr. Shaeffer reported the receipt of the following exchanges :

Verhandl. d. k. k. Zool. Bot. Gesellschaft, LIV, Nos. 8 and 9.

Proc. Amer. Philos. Soc., XLIII, No. 177.

- Proc. Amer. Acad. Arts and Sci., XL, No. 10.
Relatorio du Directoria Soc. Sci. de S. Paolo.
Proc. Canad. Inst., N. S., Vol. II., No. 12, Pt. 6.
Springfield Mus., Nat. Hist., Bull. No. 1.
Canad. Ent., XXXVII, Nos. 1 and 2.
Wien. Ent. Zeit., XXIII, Nos. 8, 9 and 10.
Proc. Davenport Acad. Sci., Vol. IX.
Stett. Ent. Zeit., Vol. 65, Hft. 2.

Mr. Leng spoke of "Collecting on Mt. Whiteface in the Adirondacks." He gave an account of his collecting experiences, with a general description of the locality, and named some of the more conspicuous species of Coleoptera taken, among which were: *Cychnus brevoorti*, *C. canadensis*, *C. leonardi*, *Pterostichus punctatissimus*, *P. luesatii*, *P. mandibularis*, *Trechus chalybæus* and *Platynus 4-punctatus*. All of the insects taken near the summit were distinctly northern species, otherwise known from Hudson Bay and British America.

Mr. Bueno read a paper on the genus *Notonecta*, stating that of the twenty described species, twelve are peculiarly American and the thirteenth extends entirely across the palearctic region through Europe, Asia and in North America down through British Columbia. Eleven of these thirteen species are to be found within the United States. He discussed the structural and color peculiarities of these eleven species as well as their habitat.

MEETING OF MARCH 21, 1905.

Held at the American Museum of Natural History. President C. H. Roberts in the chair, with twelve members in attendance.

The librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

- Entomol. Tidskrift, 1904, Vol. XXV, Nos. 1-4.
Allgem. Zeits. f. Entom., Vol. IX, Nos. 23 and 24.
North Carolina Dept. of Agric. Div. of Ent. Circulars, Nos. 13 and 14.
Zeits. f. Wissenschaft. Insectenbiologie, Vol. I, Nos. 1 and 2.
Mus. Brooklyn Inst. Sci. Bull., Vol. I, No. 4.
Zool. Record, 1903. Insecta by Dr. Sharp.
Wien. Ent. Zeit., XXIV, Nos. 1 and 2.
Canad. Ent., XXXVII, No. 3.

President's Report of the Univ. of Montana for 1903 and 1904.

The secretary reported that the New York Academy of Sciences had granted permission to the society to place suitable book cases in their meeting room.

The secretary read a communication from Dr. J. B. Smith, requesting the society to coöperate in organizing a National Entomological Society, and to elect a delegate to represent its interests.

Mr. C. Schaeffer was elected as such a delegate.

The resignation of Mr. E. A. Bremser as an active member was accepted with regret.

The society had the pleasure of listening to a very instructive lecture by Dr. E. P. Felt on the "Structure of the Culicidæ," illustrated by numerous interesting lantern slides.

MEETING OF APRIL 18, 1905.

Held at the American Museum of Natural History. President C. H. Roberts in the chair with nine members present.

Mr. Leng read a paper on "Collecting in the Pine Woods of North Carolina." He and Mr. Harris arrived at Southern Pines, N. C., on the 25th of March and collected in that vicinity for three days. In his description of the country Mr. Leng stated that it was much like Lakehurst, N. J., but not so flat. The weather was warm and the fruit trees were all in full bloom. Butterflies and cicindelas were flying plentifully. A striking feature of the landscape was the peculiar long-leaved pine with its great bunches of mistletoe. Most of the tiger beetles noticed belonged to three species: *unicolor*, *vulgaris* and *repanda*, which were evidently hibernating specimens judging from their condition. Mr. Leng exhibited the collection which was made on the trip.

Mr. Schaeffer stated that because of the great activity of the coleopterists, new and additional material is being secured which helps to clear up doubts, correct mistakes, and also in many instances overthrows even recent synopses of genera or families. As an illustration he exhibited eight or nine species of *Anomala* which had been found in Arizona, New Mexico and Texas which are new to our fauna; some of them known Mexican species and three entirely new, bringing the number of species up to twenty. He further remarked that *luteipennis* of Leconte was in his opinion attributed to the wrong insect as the "pygidio parcius, sat grasse punctato" does not fit the pale specimens of *binotata* from Texas and Arizona, but those specimens of *flavipennis*, which are metallic green and have the elytra testaceous, occurring in Texas, agree much better with the description. The pale form of *binotata*, regarded by Dr. Horn and others as *luteipennis*, and revived by Major Casey and Dr. Ohaus to specific standing, he thinks, as did Dr. Horn, that it is impossible in a moderately large series to retain it even as a variety. The type of *innuka* of Fabricius, of which Dr. Horn was in doubt, as well as Burmeister's type of *minuta*, were examined by Dr. Ohaus, and the good description of both given by the latter enabled Mr. Schaeffer to correctly identify both species, and that what we have called *minuta* is *innuka*; the true *minuta* belongs to the subgenus *Rhomhonyx* and are, in his opinion, undoubtedly those darker forms of *semilivida* mentioned by Dr. Horn in his paper.

H. G. BARBER,
Secretary.

JOURNAL
OF THE
New York Entomological Society.

Vol. XIV.

JUNE, 1906.

No. 2

Class I, HEXAPODA.

Order IV, DIPTERA.

GOELDI'S "OS MOSQUITOS NO PARÁ."

BY FREDERICK KNAB,

WASHINGTON, D. C.

This handsome quarto by Dr. Emilio Augusto Goeldi, published as Memoir IV of the Museu Goeldi (Pará Museum), deals with the mosquitoes of Pará (Brazil). The species treated of are chiefly those that molest man, their biology and relation to hygiene and a large part of the work is devoted to *Stegomyia fasciata* and *Culex fatigans*, preëminently the town mosquitoes of the tropics. The 154 pages are replete with interesting data and suggestive ideas. The author throughout, is careful to distinguish between fact and theory, so that the volume is a highly inspiring one to students of this subject. The text is in Portuguese, unfortunately made difficult for those not proficient in the language, by a rich and picturesque literary style, which aims to be popular as well as scientific, and must certainly make it attractive to Brazilian readers. There are fifteen plates, with numerous figures, illustrating the life histories of the various species, and five very fine color plates figuring the imagos of fourteen species, in most cases of both sexes.

In this work are brought together the observations published under the same title in two previous bulletins (1902, 1904), augmented by a great deal of new matter, and detailed accounts of the early stages of most of the species considered, and in the fourth chapter is appended the paper on *Stegomyia fasciata* read before the International Congress of Zoölogists at Bern in August, 1904, and now translated from the

German into Portuguese. The book is divided into the following chapters: I, The mosquitoes of Pará considered as a public calamity; II, Review of results of experiments made in 1903, particularly with *Stegomyia fasciata* and *Culex fatigans*, from the sanitary point of view; III, Biological details; IV, *Stegomyia fasciata*, the transmitting mosquito of yellow fever and the actual state of knowledge relative to the cause of the disease. The author did not, however, bring all his data together under their respective headings, which is troublesome to the reader, but perhaps inevitable with such wealth of material.

The first chapter opens with an introduction to the Culicidæ, definition of some of the more important genera and data on the distribution of species culled from Theobald's Monograph. The author then turns to the species of Pará. Of the 42 species recorded from Brazil, 18 have been found at Pará, 17 of them by the author; five of these are new. This seems a very small showing for so favorable a locality; but this is perhaps due to the fact that the author has given most of his attention to the biologic and economic part of the subject. I will only mention in comparison that more than 50 species of mosquitoes are known from the Island of Trinidad, and indications are that it is by no means exhausted. The genera known from Pará are *Anopheles*, *Megarhinus*, *Psorophora*, *Janthinosoma*, *Stegomyia*, *Culex*, *Taniorhynchus*, *Sabethes*, *Hæmagogus*, *Wyeomyia*, *Limatus* and *Trichoprosopon*. A number of these genera are not treated in the present work, but the author promises an account of them in a future paper. Then follow short notes on some of the species. *Megarhinus separatus* is not rare in the vicinity of the city. It is strictly a forest mosquito and diurnal. Its bite is reputed to be painful, but the author has not yet been able to verify this from personal experience. *Janthinosoma*, of which the author has taken *J. musica*, is dismissed, as, in the author's experience, of no faunistic importance. This seems remarkable, as elsewhere in tropical America *Janthinosoma* is one of the most conspicuous forms. In connection with *Stegomyia fasciata* its excessive abundance in the city, its diurnal habits and severe bite are noted. In the reviewer's experience the bite of *Stegomyia* can hardly be called severe; indeed the bite is often hardly noticeable, and this, together with its stealthy habits, the more easily make it the transmitter of the dread yellow fever. *Culex fatigans* is spoken of as a horrible nocturnal scourge in certain parts of the city. *Taniorhynchus* is crepuscular, invades the dining room, flies onto the table and into

the plates. It alights leisurely and without ceremony upon the face and hands, and then bites painfully. It is of such a voracious disposition that it can easily be crushed without its attempting to escape. Of the beautiful *Sabethes*, with metallic colors and plumed tibiae, three species occur. They are diurnal forest mosquitoes and are sometimes common enough to become troublesome. They bite ferociously and leave a relatively intense inflammation, evidently due to the large dose of poison injected.

Of especial interest is the figure on Plate V, showing the attitude of *Sabethes longipes* in flight. The position of the hind legs, raised over the back and bent well forward, is characteristic of the entire subfamily *Sabethinae* — at least it holds good for the species of a number of genera that the reviewer has had opportunity to observe in nature. Those who have seen living specimens of *Wyeomyia smithii*, the only known representative of the group in the United States, will recall this very striking attitude, which has been described by Dr. J. B. Smith on p. 343 of his Report on the Mosquitoes of New Jersey (1904).

Turning now more particularly to the economic aspect of his subject, the writer states that four species are the most important in Pará, not only as physical torturers and destroyers of peace, but as a menace to health. Three of these have taken a firm footing within the city in the last few years and relieve each other in their daily attacks inside the house, greatly injuring the credit and reputation of Pará as a habitable tropical city. The fourth species holds the outskirts and vicinity and constantly threatens human existence in the swampy regions of the interior. Branded by modern science as the vehicle and transmitter of malarial fevers it constitutes a serious obstacle to the progress of the country and is directly guilty of serious injury to public prosperity. The mosquito last alluded to is *Anopheles* represented by *A. albipes*. The fearful abundance of this species at Macapá and in the region bordering Guiana, and coincident with this an epidemic of malaria, was observed upon two museum expeditions. The author convinced himself of the correctness of the popular statement that this mosquito has a strong predilection for forests of siriúba (*Avicennia*), and so numerous are they there that, even in passing through such woods in the daytime, the face and hands soon become black with them.

The second of the four above-mentioned important species is *Stegomyia fasciata*. The description of the insect, with an account of its distribution and its rôle in yellow fever, is followed by observations

upon the species in Pará. It is excessively abundant in houses and hovers over persons' heads in troops of four to ten or more. It bites from sunrise until evening and a person is bitten at least 50 or 100 times a day. Seeking out any uncovered part it inflicts its painful bite which afterward swells. There is not a minute of rest from day-break to nightfall; it is impossible to defend oneself against them and soon face, neck, hands and legs are covered with burning swollen points. The author exclaims, "I do not know of another factor in this city so hurtful and actually pernicious to intellectual work, to scientific study and investigation in the quiet of the cabinet and laboratory as this execrable creature which is called *Stegomyia fasciata*!" *Culex fatigans* follows in importance and insupportability as a nocturnal complement to the diurnal *Stegomyia*. Surprising, but perhaps after all not far from the truth, is the author's statement that he considers the nocturnal habit exceptional and that the majority of mosquitoes are diurnal. According to Dr. Lutz, *Culex fatigans* is the common nocturnal mosquito throughout Brazil, found everywhere and biting only at night. At Pará the abundance of this mosquito is simply astonishing; in the suburb of Nazareth it assaults the houses in clouds during the first hours of the night and fairly throws itself against the person. The hum of myriads of these mosquitoes, flying and in courtship, in a dark room is enough to make one's hair stand on end. "I am apprehensive each time I hear this odious music, when I think of the sad consequences to health, of which, in my firm conviction, it is the fatal precursor and messenger!" The writer here alludes to *Culex fatigans* as the transmitter of filariasis. While it is mostly the black race and its crosses that is persecuted by this disease there is great danger to everybody at Pará where black and white sleep without mosquito-bars in the same rooms, infested with this mosquito.

The fourth of the above-denounced mosquitoes is *Teniorhynchus fasciolatus*. While the author agrees with Dr. Lutz that this is a genuine swamp mosquito he adds that at Pará it enters the houses at twilight. Its bite is painful and it has a voracious disposition, yet it is ingenuous and phlegmatic, if not to say entirely stupid. The specimens observed at Pará differ from the colored figure in Theobald's work by their darker color, a circumstance which has already been noted by that author.

The biology of mosquitoes is next treated in a popular way and the differences in the early stages of *Culex*, *Stegomyia* and *Anopheles*

pointed out. A count of the eggs in two egg-boats of *Culex fatigans* gave respectively 270 and 225 eggs.

There is an interesting observation on the difference in food habits of the two sexes. Outdoors the males feed on ripe fruits and flowers; in the house they go to sugar, coffee, tea, wine, soups and all sweet substances, and abstain from sucking blood. The females are blood-suckers and the difference in food habits is brought out in the following experiments. In the first experiment mosquitoes were observed swarming about the sugar bowl. It was quickly covered with a paper cone and the mosquitoes within chloroformed. There were 37 dead mosquitoes — 1 ♂, 1 ♀ *Stegomyia fasciata*, and 33 ♂, 2 ♀ *Culex fatigans*. This experiment was repeated a number of times with only a slight variation in the percentage of the sexes. This was in the dining room, the second contrasting experience in the bed-room. Far in the night the author noticed that outside of a certain part the mosquito-bar, close to his face, the mosquitoes were dancing up and down in a manifest endeavor to find a hole that would admit them. With a sudden slap of the hand a number of them were crushed against the wall. Examination showed that there were 23 dead *Culex fatigans* — all females. And thus, in the bed rooms, there always proved to be an enormous majority of females in quest of blood, to the exclusion of the males.

An explanation of the blood-sucking habit is offered, as follows: Few readers, particularly in the tropics, have not had an opportunity to observe how any scratch or wound on exposed parts of the body is persecuted by a multitude of small flies and related insects which come to sip the blood-serum, a slightly sweetish substance. One also knows how, during dry periods, the margins of the eyes, for example in the large mammals, are persecuted by the same impertinent Diptera, attracted by the "aqueous humor" with which the eye-ball is moistened. Now all these small Diptera, in common with ordinary-sized one (*Stomoxys*, etc.) and other large ones like the Tabanids, indicate the path gone over by the hæmaphiles. The Culicids, primitively only sucking sweet juices, became acquainted with animal blood through the blood-serum of wounds. The males contented themselves with this, the females reached the point of intentionally perforating the skin to gain possession of the desired liquid. Seconded in this mission by a stouter beak better fitted for piercing than in the male, and thus taking advantage of the liquid so easily obtained to

gain strength for the demands of egg-production, a disposition to this proceeding would become a habit and normal, and finally an indispensable postulate. The sucking of blood, acquired accidentally as a secondary habit, becomes an essential factor in the mosquito's life in relation to the ripening of the sexual products of the female. Today these insects must have blood for the propagation of their species.

The description of the mating of mosquitoes is of great interest, as very little has been made known on this subject. The species observed is *Culex fatigans*, although the author fails to specify this. On a subsequent page, in the second chapter, he treats of the mating habits of *Stegomyia fasciata* and compares them with those of the present species. The swarms of *Culex* that enter the houses at night-fall in dense clouds are principally males which seek the females already there. The infernal music of innumerable mosquitoes assails one's ears and at the same time they dash against one's face. Striking light one sees the multitude dancing and cutting frantic capers. There are two swarms, one composed entirely of males, the other only of females. The sexes are guided towards each other principally by the song and one soon perceives that there are two sounds, the higher produced by the males, the lower by the females. The actual sexual union is wholly devoid of ceremony. Some female detaches herself suddenly from her companions and approaches the cloud of dancing males. Immediately she is seized by a male and united they retire from the swarm. It is not rare that such pairs forget all prudence and in their frenzy hit against everything and even roll upon the ground. In some cases a female is seized by two males at the same time and all three fall, rolling over each other in the fiercest sexual frenzy. Theobald says, "I have never seen a male *C. pipiens* or of any other European species indoors." In Pará the males of both *Culex fatigans* and *Stegomyia fasciata* daily invade the houses in swarms. Oviposition (of *Culex fatigans*?) is said to occur only at night. The observations on the localities where the eggs of *Culex fatigans* and *Stegomyia fasciata* are laid agree with those of Durham and Myers. *Culex fatigans* contents itself with any ditch, no matter how muddy or foul, puddles of waste water and drains, and is easily reared in the laboratory. *Stegomyia fasciata* is quite particular in the selection of breeding places. It prefers relatively clean water and is customarily found in the depressions of the horizontal rain-gutters on houses, in barrels, jars and other receptacles, in the still folded leaves of banana plants, the leaves of bromelias, etc. In captivity the

larvæ do not prosper in water containing other matter than their essential food, algæ and other cryptogams.

The paragraph on mosquitoes as agents of disease reviews what is now known on this important subject and briefly states the part taken by the different investigators in bringing out the facts. The species of mosquitoes that are known to transmit disease are enumerated and the diseases they carry. In the mention of *Filaria immitis* in the dog, transmitted by *Culex fatigans*, the writer states that he has found this disease in dogs at Rio de Janeiro and sometimes the left auricle of the heart is filled with a ball of these worms.

Under the caption "Practical results which urgently claim attention" the various methods of mosquito control are discussed. The baneful effect of mosquitoes is again emphasized, not only as direct agents of yellow fever and other diseases but also as the destroyers of spiritual peace and the producers of neurasthenia through the constant infliction of physical pain.

Chapter II gives a series of experiments with *Stegomyia fasciata* and *Culex fatigans* to ascertain the relation of meals of blood to copulation and to oviposition. Upward of 220 adults of both sexes of *Stegomyia fasciata* and 260 of *Culex fatigans* were used in these experiments. At first captured mosquitoes were used, but later the experiments were carried on with bred specimens. The fertilized females were fed with honey and water on the one hand, and with human blood or that of the guinea pig on the other. It is shown that one or more meals of blood are essential to the development of the eggs. Lack of space forbids giving even a synopsis of these experiments. It is only possible to give the author's final conclusions, which apply more particularly to *Stegomyia fasciata*, and state that in general they are borne out by the experiments. In brief his conclusions are as follows:

1. Honey prolongs the life of the mosquito in captivity and is taken with avidity, not only by the female, but above all by the male.
2. Blood of vertebrates is eagerly and persistently sought by the female; obtained by sucking it shortens life as further explained. Blood drawn in other ways, although fresh, is refused or accepted with indifference not only by the males but also by the females.
3. Sucked blood is a food which favors and accelerates the laying of eggs and produces a certain, energetic and immediate reaction in the organization of the female, perceptible from the first ration.

4. Honey, on the contrary, has a retarding, interrupting, or at least neutral effect upon oviposition. The same is true of other sweet liquids and vegetable food.

5. With certain mosquitoes, in captivity, we have the power to prolong life and suppress oviposition, or bring about prompt oviposition by withholding or supplying blood as food.

6. It is a fact that in previously fertilized females of *Stegomyia fasciata* the faculty of laying fertile eggs can be preserved latent during periods of from 23 to 102 days and called to life at pleasure by changing the diet to one of blood.

7. In other words: A diet of honey is of advantage to the individual by prolonging life, but of disadvantage to the species, for it retards reproduction. A blood diet, on the contrary, is prejudicial to the individual, for it shortens life, and most advantageous to the species, as it favors reproduction.

8. We have the right to call blood an indispensable factor in the production of fertile eggs. By the above experiments, what has so far been only a hypothetical supposition, has now been definitely proven.

9. Unfertilized females, bred in captivity and in strict isolation, readily accept blood. Copulation is not a necessary preliminary to enable the female to practice hæmatophagy.

10. These unfertilized females of *Stegomyia* may lay eggs, though these are not fertile and do not produce larvæ.

11. Oviposition completed, the female, both of *Stegomyia* and of *Culex fatigans*, dies in the following days, in most cases immediately afterward. The female survives in cases where oviposition is incomplete until the fractional deposits have made up the total.

12. In order to make a complete deposit of eggs it is necessary that the female of *Stegomyia* should have several successive rations of blood, at least two or three. With *Culex fatigans* the results on this point have not been equally decisive.

13. The respective interval between the meal of blood and oviposition, taking the average, for *Stegomyia fasciata* is 3.7 days = 88.8 hours, and for *Culex fatigans* 3.5 days = 84 hours.

14. The interval from the time the eggs are laid to the appearance of the larvæ, taking the mean, is, for *Stegomyia fasciata*, 4.5 days = 108 hours, and for *Culex fatigans* 1.8 days = 43.2 hours.

The second chapter closes with an extensive account and discussion of the habits of *Stegomyia fasciata*, which clearly demonstrates that this

species has become completely domesticated. While certain species of mosquitoes probably persecute by preference particular animals, among all the mosquitoes there is none that has so exclusively adapted itself to the persecution of man in the tropics as *Stegomyia fasciata*. Along the Atlantic littoral of South America it fastens upon the heels of man wherever he settles in numbers and the houses are concentrated into cities of any size. Steam navigation has been the means of spreading the species, and only by taking into account this fact can its present geographical distribution be understood in its details. A valuable illustration is furnished by the manner in which *Stegomyia* is little by little conquering the Amazon valley. It has departed, by exception, from the littoral route, and entering in a perpendicular direction to the coast line, has reached the remote interior. It has established itself at Manáos, capital of the state of Amazonas, a rapidly growing city of modern aspect 1,600 kilometers from Pará. However, according to reliable information obtained by the author, the species has not made itself felt in Santarém, Faro, Monte Alegre and Obidos, all cities at a much lesser distance from Pará. The author thinks that while there may be other secondary factors, the principal reason for this negative condition is the small size of these towns. The author believes that an inquiry into the data when yellow fever first appeared at Manáos, and the beginning of steam navigation with Manáos as a terminus, would show an intimate and significant relation between these two facts. The great waterway, with its direction nearly parallel to the equator, navigable for large ocean vessels to its upper reaches and with its climatic conditions most favorable to this eminently tropical mosquito, will prove an excellent highway in the conquering march of *Stegomyia*. Even while the sheets were in press, the newspapers of Pará brought telegraphic notice that the "black vomit" had made its appearance in Iquitos (Peru) on the upper Amazon. In Pará, in certain parts of the city, *Stegomyia* abounds to the point of making existence unbearable, particularly for those whose professional duties keep them at the work-table. The hot hours of the day are those in which it shows itself most blood thirsty and insistent. When one perspires slightly it persecutes by its bite with a tenacity and cruelty of which it would be hard to find another example. That the growing insolence of its persecutions goes parallel with the increasing perspiration of our body is something which must impress every attentive observer. It is evident that the perspiration of

our body plays a significant rôle in the life of this mosquito. During the hot hours of the day the head and hands of persons resting clothed, in hammock or bed, are besieged by a cloud of perhaps ten or fifteen *Stegomyias*, mostly males, in incessant serpentine evolutions. Even the males are aggressive during these hours and persecute any uncovered part of the body to suck sweat. If they do not succeed in biting it is not from lack of desire, but owing to the weak mouth-parts. Although it has been frequently asserted that the male *Stegomyia* bites and sucks blood, neither the author nor any of his colleagues have ever detected one in the act or found one dilated with blood. However, they do alight upon the person, and the author thinks they produce an irritation that only differs in degree from that of the female's bite. While the male does not succeed in perforating the epidermis it certainly irritates it, and a close study of the male mouth-parts would probably show an unusual development for that sex. The disagreeable sensation produced by the males is augmented by their truculent hum, uttered in a thin concert voice.

The habits of *Stegomyia* are now discussed in their bearing on the theory of the origin of the blood-sucking habit propounded on a previous page. Clearly sweat belongs to the same order of products as the others sought by Diptera, the blood serum and the moisture on the edge of the eyes. When *Stegomyia* first associated itself with man both sexes fed upon his perspiration. From this stage the females progressed to the habitual perforation of the epidermis and became professional suckers of human blood. The males continue in the historically more ancient stage of lappers of sweat and similar secretions of the human body.

When *Stegomyia* is abundant one observes that the males show a certain aloofness and tendency to congregate apart from the females in little clouds of 15 to 20 or more. This manifests itself, for example, when the males congregate over the edge of a table or cabinet while the females are circulating about the room, or they collect about the upper part of a mosquito-bar while the females are reconnoitring beneath the bed. These elevated positions are points of vantage from which the males pounce upon any female that they detect crossing the area of their dominion.

Stegomyia is a singularly light-loving mosquito. This is shown by the merry hum of the males as well as the females, dancing in animated swarms, when the moderate sunlight of late afternoon shines

into their cages. The sounds produced under these conditions were determined with the assistance of two musically educated colleagues and by the use of a cither and diapason with determined vibrations. The note of the female corresponded to C in the treble clef and that of the male to the A above. The male note has 880 vibrations, that of the female 480, and the two sounds hold the relation of a sextad to each other. In both cases the impression was obtained that along with the principal note the respective octaves were heard, so that the timbre was obscured by the concomitant notes. A certain effect upon the height of pitch is exercised by the greater or less dilation of the abdomen with food and perhaps also in certain psychic states and under the influence of mutual suggestion. According to Nuttall and Shipley the note of *Anopheles maculipennis* in the male coincides with that of *Stegomyia* while in the fed female it is in the neighborhood of low C with 240 vibrations, an octave lower than in *Stegomyia*.

Little appears to have been made known about the copulation of *Stegomyia*. The author states that he has seen it millions of times and sees it every day, but, as yet, has not been able to describe it satisfactorily in its minor details. In general outline the process is as follows: a male, from his outlook, precipitates himself upon a female that comes flying near and attaching himself to the under side allows himself to be carried in gentle flight for a few seconds (not more than two or three) and again departs. It is the work of a moment and it is really surprising with what rapidity the act is accomplished. The flight is so short that it is executed without difficulty within a cage, a fact which makes it possible to breed successive generations of the species in captivity. As well as one can judge, without previously marked individuals, the same male copulates several times in rapid succession with diverse females that approach. The process differs from the bacchanals of *Culex fatigans*, described on a previous page, in that there are not two distinct swarms, one of males, the other of females. Still there is a tendency to keep separate, a kind of antagonism already alluded to. The nuptial flight of *Culex fatigans* is likewise only of a moment but it seems to require more space and therefore is not realized in captivity with the facility, one might almost say mathematical precision, of *Stegomyia*.

The writer thinks that *Culex fatigans* is more obstinate, timid and rebellious in behavior and more refractory to domestication. He believes that a proof of this is the singular circumstance that of all

the trials made with females in captivity, both captured and bred ones, only one sucked blood. *Culex fatigans* shows itself much inferior to *Stegomyia* in intelligence and this agrees well with the idea that, like other hæmatophagous insects, this mosquito is principally found in relation with a definite vertebrate host. The author believes that primitively *Culex fatigans* was less partial to the human species than to certain domestic animals and his suspicion points mostly to its being an inquiline of poultry-houses. Is it not possible that in this evident intellectual diversity of these two species of mosquito the diversity of their respective primitive hosts is reflected? Surely no one will dispute that it requires a more expert mosquito to persecute man than poultry, cats or dogs.

Discussing the original home of *Stegomyia fasciata*, the author expresses his belief that it is of African origin. He bases this idea largely upon a study of the geographical distribution of the genus *Stegomyia* by means of the data gathered from Theobald's Monograph. Of the 21 known species of the genus, eleven, or more than half, are African, while only four are American. The author fails, however, to take into account the fact that our knowledge of the mosquito fauna of tropical America is extremely fragmentary. At least three additional species of *Stegomyia* are now known from the West Indian region, which, with the neighboring coasts, most likely represents the home of the American *Stegomyias*.* *Stegomyia fasciata* is now so widely dispersed that a study of the species itself will hardly furnish a clue to its original habitat. The author believes that *Stegomyia fasciata*, along with other afflictions such as filariasis and the sand flea (*Sarcophylla penetrans* L.), has followed in the wake of the slave trade probably in quite early times. Of course it is quite as likely that the reverse is true and that the species has been disseminated from America. The whole question is inseparably bound up with that of the origin of yellow fever and perhaps the history of this disease will furnish proper data to settle the question. The author touches upon this part of the subject in Chapter III, where he resumes the discussion of the probable

* Since the above was written these three species referred to have been described by Mr. D. W. Coquillett. Two of them, together with *Stegomyia sexlineata* Theob., are placed by Mr. Coquillett in a new genus *Gymnometopa* (Proc. Ent. Soc. Wash., VII, 183). It should be noted that it is highly doubtful that the genus *Stegomyia* represents a distinct and homogeneous group. Most of the recently made Culicid genera are based upon very unsatisfactory characters and do not represent natural groups, as is clearly apparent from a study of the larvæ.

origin of *Stegomyia fasciata*. He concedes that the malady which carried off part of the crew of Columbus was most likely the yellow fever, but protests that this does not constitute a proof against its previous existence in Africa. A further argument is sought in the close association of *Stegomyia fasciata* with man and its partiality to large cities. He asks where were the large cities on the Atlantic coast between the Antilles and the Rio Plata? He further states that the indigenous American was at all times what he still is to-day; jealous of his absolute freedom, he has neither the habits nor the inclination necessary to concentrate himself in cities of really large size. The characterization of the native American which follows is a very faithful portrait of the Amazonian Indian and will apply, in the essential points, to our North American Indians as well. He contrasts with the retiring characteristics of our Indians the excessive sociability of the African. All the accounts of African travelers abound with exclamations of surprise at the number of towns reaching a size beyond easy estimation. The author has, however, entirely ignored Mexico and Central America, peopled in great part by natives of advanced culture and entirely different character from the primitive races to the north and south. Surely the writer is not wholly ignorant of the historical accounts of the dense population of peaceful agriculturalists that inhabited the region at the time of its discovery and the extensive cities, doubtless of great age, that existed then. We know that even upon the author's own ground, the lower Amazons, at the time of the discovery there was a dense agricultural population congregated in large towns—a population probably far in excess of that of the present day.

The author likewise assumes an Ethiopian origin for *Culex fatigans* and points out the close correspondence in the distribution of this species and *Stegomyia fasciata*, as shown in the maps given by Theobald, and this he believes to be by no means accidental. It is fitting here to call attention to the uncertain status of some of the species of *Culex*, particularly those of the group to which *C. fatigans* belongs, and the absolute impossibility, in some cases, to refer specimens to their proper species with certainty. The author himself, on another page, points out that the variety *skusii* of *Culex fatigans* must be a distinct species, as the larval characters differ widely in the two forms. From a study of the larval material brought together by Dr. L. O. Howard for his forthcoming monograph of the Culicidæ the reviewer has

reached the conclusion that the American form known as *Culex fatigans* represents a distinct species peculiar to the tropical and subtropical regions of this hemisphere.

The author believes that *Stegomyia fasciata* and *Culex fatigans* are inseparable allies, always to be found together, the nocturnal *Culex fatigans* supplementing the diurnal *Stegomyia fasciata* in the persecution of man and the two constituting a strong combination against him. He believes that future studies will show that the influence of these two mosquitoes, over and above the grave diseases which they transmit, is the principal cause of tropical anemia.

Attention is called to the occurrence of dwarf specimens, both of *Stegomyia fasciata* and of *Culex fatigans*, a circumstance of considerable importance as they succeed in passing through screens effectual against normal mosquitoes. At certain seasons these dwarfs are more numerous and even become the predominating form. Thus it appeared that in the last weeks of October and in November, just before the opening of the rainy season, these small females were particularly numerous. These dwarf mosquitoes are the product of adverse conditions during development, such as the reduction of water and food in the dry season, so that there may be said to be a small æstival generation. It is a wrong opinion that the individuals of this dwarf race are less aggressive and blood-thirsty than those of normal size; they behave in every way the same and their bite is equally painful.

One cannot suppose that on the whole Brazilian coast, southward to Rio Janeiro or Santos, there is a single place where the development of *Stegomyia* ever comes to a standstill. There are larvæ throughout the year, although there will be fluctuations in the rate of development corresponding to hot or cold, wet or dry season in the different localities. Inquiries into these conditions gain particular importance through their relation to the periodicity of yellow fever.

From the experiments it appears that *Stegomyia fasciata* shows a decided preference for human blood over that of the guinea pig, and human blood seems to have a more favorable effect upon oviposition. Reptilian blood, that of a lizard (*Tropidurus torquatus*) was offered but not accepted.

As all other mosquitoes are extremely sensitive to currents of air it is remarkable that *Stegomyia* is quite indifferent to even a strong wind. The author found that a strong wind blowing into a window, or the current of air from an electric fan, did not in the least interfere with

the evolutions and biting of the *Stegomyias*. It appears likewise to be quite indifferent to strong odors as in one case that from a floor saturated with creoline did not affect them. Strong mediums are necessary, such as fumes of sulphur, chlorine or strong fumigation with pyrethrum.

The question whether *Stegomyia fasciata* bites at night is of importance in view of the often mentioned "diarios de Petropolis," that is, the security from yellow fever enjoyed by those who spend the day in the city of Rio de Janeiro but return to their homes in the nearby mountains before nightfall. The author professes that he approached this question with great scepticism. However now he is in possession of quite a number of perfectly verified cases in each of which the mosquito was taken "en flagrante" and identified by him. These cases occurred both at Rio de Janeiro and at Pará. Nearly all the cases observed at Pará occurred in nearly the same manner, between the hours of eight and eleven at night while the author was writing by an electric light, the window open. The mosquitoes that alighted upon the hands and sucked blood were generally *Teniorhynchus fasciolatus* or *Panoplitus titillans* but now and then a female *Stegomyia* presented itself. The bites personally observed at Rio de Janeiro occurred during the same hours in a room of the library. The author always noticed that during the day he was more persecuted by *Stegomyia* in that room than elsewhere and he quickly discovered that the mouldings and the upper and under sides of the shelves were the chosen hiding places of these mosquitoes. These cases, however, are not the rule but exceptional; perhaps one in a hundred bites at night and then only with light, not in complete darkness. The weak light of the night-lamp in a sleeping room is perhaps sufficient. These observations do not weaken the statement that *Stegomyia fasciata* is essentially a diurnal mosquito. Now and then some female overpowered by hunger prolongs its hunt into the night, above all when stimulated and guided by the light in a room. That *Stegomyia* will readily accept blood at night in captivity the writer considers an anomaly due to the unnatural laboratory conditions. There is a popular saying that to get rid of mosquitoes it is only necessary to put out the light. This advice, if it does not simply allude to the fact that the healthy organism, tired from the day's occupation, falls asleep more readily in a dark room, must refer to *Stegomyia fasciata*. In the case of *Culex fatigans* and *Anopheles* the promised result will certainly not be realized.

But there is still the possibility that perhaps the female *Stegomyias*

seeking blood at night are themselves the victims of an anomaly and acting under a morbid impulse, perhaps produced by a parasite. Perhaps there is here some relation with the agent of yellow fever!

The third chapter, "biological details," contains a great deal of interest, and it is to be regretted that the details, particularly of larval structure, are not more full. The plates that accompany this chapter are of great interest, particularly the figures from photographs of eggs, larvæ and pupæ, more or less magnified. The figures from drawings, we are sorry to say, are not equally commendable, and, at least in some cases, appear superficial and inaccurate. Some of these inaccuracies will be pointed out in connection with the following notes. Sixteen species of Culicidæ, three Chironomidæ and a *Simulium* are dealt with, but of some of the species the early stages remain unknown and only notes upon the imago are given.

Culex fatigans and *Stegomyia fasciata* are treated most fully, and each of these species is illustrated by two double-page plates. One of these plates is entirely given up to the eggs of *Culex fatigans*, and the figures, from photographs, of the eggs singly and in rafts, are very excellent. As the author remarks, these eggs do not appear to differ in any way from those of *Culex pipiens*. Regarding the small globule at the pointed end of the egg, the writer at first followed the supposition of previous writers that it is air. Closer study of its optical qualities and behavior in various liquids used in microscopic technique showed that it is of a gelatinous or mucilaginous substance. The globule is detached by the slightest pressure and in the water swells and then disappears altogether. At the same time the author became convinced that the entire base of the fresh egg-raft is covered by a layer of gelatine, similar to the substance present in so many other insect eggs, and even those of vertebrates. He attributes a hydrostatic function to the globule. Both the globule and the lower layer disappear before the breaking up of the egg-boat, which begins soon after the larvæ have hatched. The author thinks that this gelatinous substance may perhaps furnish the first food to the young larvæ. The cup-shaped appendix on the rounded end of the egg has been figured by several authors, but without comment. The author thinks it is connected with the intra-ovarial period, the remnant of the germinative chamber and entirely without physiological significance after the egg is laid. The figure of the sculpture pattern of the interior of the cup shows series of points arranged around a central round depression.

The female of *Culex fatigans*, in ovipositing, shows great predilection for water containing animal matter. A vessel in which the skulls of several small mammals were being macerated after two or three days contained a great number of egg-boats—at least 100 or 200—and further tests gave the same result. This fact could be utilized and the mosquitoes induced to lay their eggs in trap-jars, where the eggs could then be destroyed. Unfortunately the details of the larval characters given in the text and figures are insufficient and will not serve to separate this species from *Culex pipiens*. The author himself calls attention to the close resemblance between the two larvæ, but wisely remarks that it would be premature to pronounce upon the relative value of these two forms. He urges that describers should be exact and adopt a standard for description, else a labyrinth of error and confusion must result.

Culex confirmatus is noticed in Pará mostly in the dry season and frequents dry fields and gardens when water is present in ditches or natural depressions. It was noticeably abundant in a garden near Rio de Janeiro, and showed itself impertinent and besieged one in clouds of ten or twelve. It is diurnal and loves the light, and people are mostly troubled by it during the hottest hours with burning sun. The author questions that Grabham could have had the same species under observation when he states that "this species appears to be active only during the night." As a matter of fact, neither the larva characterized by Grabham (Can. Ent., v. 37, p. 404-405) nor by Dyar (Journ. N. Y. Ent. Soc., v. 13, p. 23-25) in the least resemble that figured by the present writer. The larva figured cannot be of this species, but is a *Culex* in the restricted sense, and the author correctly points out its relationship to our *Culex territans*. The large and stout antennæ bear a tuft at the set-off three-fourths from the base, and the breathing tube is extremely long and slender. The author twice succeeded in obtaining eggs from captive females fed with guinea-pig blood. The eggs are lanceolate-oval and are laid singly.

In the larva of the *Culex* sp. *indet.* from the forest of Murutucú close to Pará, attention is called to the pointed form of the anal gills, resembling those of the *Psorophora*. The figure of the labial plate is very characteristic, the pecten teeth of breathing tube bear a fringe of spines and the scales of the comb are large and simple. Doubt is, however, thrown on these characters by the two figures of antennæ, of entirely different types, for this same species and leads one to infer that the author has confused two species.

Of especial interest are the author's observations on the early stages of two species of the genus *Teniorhynchus*, *T. fasciolatus* and *T. arribalzaga*. The first information relating to the early stages of this genus was given by Dr. Goeldi in a footnote on p. 27 of his first bulletin on the mosquitoes of Pará, published in 1902, and notes furnished by him were incorporated in Theobald's Monograph, v. 3, 1903, p. 257 and 269. These observations are based upon *T. fasciolatus* but answer as well for the other species, as no essential differences were noted between the two. It is decidedly a forest mosquito, and only enters houses occasionally in the evening. It shows itself sensitive to confinement and does not survive it long. Of 170 captured females fed with blood only 25 laid eggs. The eggs are laid in a double-rowed chain, fastened together like those of *Culex pipiens*. The chain is rather strongly convex upon the lower side, and rests upon the water after the manner of the egg-raft of *Culex pipiens*. It is only after the larvæ have been hatched that it falls upon its side and disintegrates. The number of eggs in a chain was from 60 to 63 and the female dies very soon after the act of oviposition. The eggs hatch in about four and one-half days. The author compares the shape of the eggs to that of a champagne bottle but the accompanying figures do not show the pronounced neck that this description implies. The surface of the egg is covered with coarse conical papillæ. The young larvæ are of very remarkable appearance well shown in two photographic figures. The antennæ are very large and of peculiar shape but are not two-jointed as the author indicates in the drawing of fig. 76. The mouth tufts are large, the tracheal tubes very slender. Most remarkable is the form of the breathing tube, the basal portion very broad and rounded off, narrowed beyond the middle to a very slender tube terminated by a whorl of spines. The slender terminal portion somewhat exceeds in length the broad basal part and the general aspect reminds one of a peaked helmet. All attempts to rear these larvæ failed and they died after a few days. These larvæ agree quite closely in general appearance with the young larvæ of *Teniorhynchus perturbans*, described and figured by Dyar and Currie in Proc. Ent. Soc. of Washington, v. 6, 1904, p. 218-220. In this last-mentioned species, however, the eggs, about 150, are laid in a raft. No clue has yet been given to the natural habitat or food of these strange larvæ and it is to be hoped that Dr. Goeldi, in such favorable surroundings, will succeed in solving the mystery of these strange larvæ.

The eggs obtained by the author from another species, *Taniorhynchus fulvus*, leads him to express doubt that it should be retained in the same genus. He calls attention to the great dissimilarity of the imago to those of the two first-mentioned species and proposes the generic name *Chrysoconops* for this species. The eggs are short, very broad at the middle, tapering to a blunt point at each end, almost rhombic in shape. They are laid detached, in a double row which soon becomes disarranged.*

Very good figures are given of *Mansonia titillans* in the act of oviposition and of its eggs. The eggs are laid detached, in a double mass. They are broadest at middle, tapering at both ends, but much more slender than those of *Taniorhynchus fulvus*.

A plate is devoted to the eggs of *Janthinosoma musica* and *J. lutzii* which are likewise laid singly. The surface sculpture consists of recumbent spines.

Trichoprosopon nivipes demands especial attention as it is the representative of Theobald's subfamily Trichoprosopina of which the larvæ were heretofore unknown. The author obtained larvæ from the water between the leaves of Bromelias, at the base of banana leaves and like situations. The appearance of the pale larvæ is well shown in a photographic picture and their general resemblance to the Sabethinæ quite apparent. The figure of the mandibles hardly conveys the correct impression as only the slender strongly dentate portion is shown. The mandibles remind one strongly of the Chironomidæ, particularly when seen endwise and the great thickness of the base is apparent. There is reason to believe that in his notes on the young larva of *Trichoprosopon*, accompanied by a figure of the breathing tube, the author had before him the larva of *Limatus durhami* which is often found associated with *Trichoprosopon*. The pupa of *Trichoprosopon* has very small terminal paddles and the last and penultimate segments bear ample tufts of 24-26 and 14-16 hairs respectively, while the other segments bear only single hairs.

Limatus durhami, in the imago as in the larva agrees with *Trichoprosopon* in habits. Imagos in confinement refused to suck blood and laid no eggs. When fed honey they only lived from 2-8 days. The larva is characterized by a very elongated abdomen and a small, almost rectangular head. The antennæ are very small. The breathing tube

* Mr. D. W. Coquillett has recognized in *Taniorhynchus fulvus* a species of *Psorophora*, so that *Chrysoconops* Goeldi becomes a synonym of *Psorophora*.

is short and bears, both above and below, a series of hairs in pairs and singly. The comb consists of half a dozen scales in a row. The pupa is more elongate than that of *Trichoprosopon* and has, like it, tufts upon the last two segments. The paddles are very poorly developed.

The showy *Megarhinus separatus* is a common species in the Amazon region. Mr. A. Ducke, entomological preparator of the museum, has experienced its bite and compares it in painfulness to the sting of a wasp. He also obtained the eggs, larvæ and pupæ. The eggs are elongate, almost cylindrical, and float upon the water in groups of four to six lying side by side. One end of the egg is smooth, while more than half of it is granular and covered with very prominent tubercles. These tubercles are more or less constricted at the base and appear to have an opening at the tip. They serve to keep the egg afloat by the air retained between them. When the larvæ are hatched the egg splits open lengthwise at the smooth end, a mode very distinct from that observed in other mosquito eggs. The larva greatly resembles that of our North American *Megarhinus portoricensis*. Distinguishing characters are furnished in the labial plate, mandibles and antennæ. The predaceous character of the larvæ appears to have escaped the author.

Anopheles albipes is a rather rare mosquito at Pará and only appears occasionally in the outskirts at dark. The author did not succeed in finding the larvæ in their natural habitat. Eggs were obtained in the usual manner from a female fed successive rations of blood. Figures are given of the eggs greatly enlarged and also one to show their stellate grouping as laid upon the water. The young larva has two very long terminal hairs. This mosquito is distinguished by the common people from the ordinary mosquito or "*carapaná*" by the popular name "*moroçóca*."

The chapter closes with descriptions of two new species of *Chironomus*, — *C. calligraphus* and *C. holoprasinus*, — of a little biting fly "*miruim*," a species of *Ceratopogon*, under the name *Hæmatomyidium paraense*, and of the famous "*piñm*" of the upper Amazons as *Simulium amazonicum*. The eggs and larva of *Chironomus calligraphus* are figured, as also the imago of the *Ceratopogon* and its wing greatly enlarged.

Class I, HEXAPODA.

Order V, LEPIDOPTERA.

THE NORTH AMERICAN NYMPHULINÆ AND SCOPARIINÆ.

By HARRISON G. DYAR, A.M., PH.D.,

WASHINGTON, D. C.

I have prepared the following account of the Nymphulinæ (Hydrocampinæ) and Scopariinæ at the instance of Professor C. H. Fernald, who has loaned me his material in these groups. Professor Fernald has undertaken a general account of the North American Pyralidæ (except the Crambinæ and Phycitinæ), but asked me to relieve him of the work on the present groups.

Family PYRALIDÆ.

Subfamily NYMPHULINÆ.

Moths usually of very slender build, the legs very long. Proboscis present. Fore wing with vein 7 from the cell, 10 usually stalked with 8 and 9, if not, the maxillary palpi are long and dilated at the extremity. Hind wing with the median nervure not pectinate.

The group is close to the Pyraustinæ, and not strongly distinguished therefrom. I am inclined to agree with Mr. Meyrick that the group should be united with the Pyraustinæ. I follow Sir George Hampson in holding them separate for convenience sake, though in the next catalogue I expect to see them united as they were in Smith's 1891 list, where Professor Fernald followed Mr. Meyrick's very sound views.

To this group belong those peculiar larvæ which are fitted for a wholly aquatic life; but not all the larvæ of the group are so modified, so that the group is defined on no larval character.

TABLE OF GENERA.

Palpi upturned.

Palpi with the third joint long and acuminate.

Maxillary palpi filiform, moderate.

- Hind wings with the outer margin excised before anal angle....**Ambia**.
 Hind wings with the outer margin even.
 Outer margin straight**Elophila**.
 Outer margin convex.....**Geshna**.
 Maxillary palpi long, dilated with scales at extremity.
 Hind wings with the outer margin evenly rounded.....**Nymphula**.
 Hind wings with the outer margin excavated below apex..**Oligostigma**.
 Palpi with the third joint short and blunt.....**Piletocera**.
 Palpi porrect.
 Hind wings with vein 4 absent**Diathrausta**.
 Hind wings with vein 4 present.....**Steniodes**.

Genus NYMPHULA Schrank.

- Nymphula* Schrank, Fauna Boica, ii, 162, 1802.
Hydrocampa Latreille, Fam. Nat., 478, 1825.
Paraponyx Hübner, Verz. bek. Schmett., 362, 1827.
Synchlita Lederer, Wien. ent. Mon., 1863, 448.
Nymphælla Grote, No. Am., Ent., i, 97, 1880.
Hygraula Meyrick, Trans. N. Zeal. Inst., xvii, 129, 1885.
Hydeuretis Meyrick, Trans. ent. soc. Lond., 1895, 435.

Palpi upturned, the second joint moderately fringed with hair in front and reaching vertex of head, the third well developed and acuminate; maxillary palpi long and dilated with scales at extremity; frons rounded: antennæ usually annulated; ocelli usually prominent; legs long, the tibiae usually smooth with the spurs almost equal. Fore wings with veins 3, 4, 5 from angle of cell; 7 straight and well separated from 8, 9, 10; 10 usually stalked. Hind wing with the cell about half the length of the wing; veins 3, 4, 5 from angle; 6, 7 from upper angle; 7 strongly anastomosing with 8 (Hampson).

Synopsis of Species.

- Hind wings white, the median lines obsolete.
 Sexes usually dimorphic, the male with spots on forewing, the female uniformly dark gray**maculalis**.
 Hind wings with dark lines, usually distinct, at least traceable, or all dark.
 Hind wings with the central fasciæ even and parallel.
 Hind wings with the central fasciæ approximate, wavy**allionialis**.
 Hind wings with the central fasciæ remote, straight.
 Fore wings shaded with brown; outer median band of hind wing broad.....**obscuralis**.
 Fore wing white; mesial bands of hind wing alike.....**badiusalis**.
 Hind wings with central fasciæ irregular, divergent centrally or lost.
 Lines of hind wing indistinct, clouded.
 Wings obscured by dark gray.
 Discal spot white, contrasted.....**obliteralis**.
 Discal spot metallic gray, obscure.....**nomophilalis**.
 Hind wing white, the lines faint.....**gyralis**.
 Lines of hind wing well marked.

Fulvous discal spot of hind wings without black edge.

Smaller, darker fulvous shaded, the marks contracted, the white areas reduced **nebulosalis**.

Larger, paler fulvous shaded, the marks expanded, the white areas developed **icciusalis**.

Fulvous discal spot of hind wing with a black edge **ekthlipsis**.

Nymphula maculalis Clemens.

Sironia maculalis Clemens, Proc. Acad. Nat. Sci., Phil., xii, 218, 1860 (♂).

Nephoteryx seminivella Walker, Cat. Brit. Mus., xxxv, 1717, 1866 (♀).

Nymphæella dispar Grote, No. Am. Ent., i, 97, 1880.

Paraponyx maculalis Grote, New Ch. List N. Am. moths, 54, 1882.

Nymphula maculalis Fernald, Smith List Lep. Bor. Am., no. 4185, 1891.

Nymphæella maculalis Hart, Bull. Ill. Sta. Lab. Nat. Hist., iv, 167, 1895.

Nymphula seminivella Hampson, Trans. Ent. Soc. Lond., 142, 1897.

Nymphula maculalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4495, 1903.

Male. Wings elongate, inner margin nearly as long as costa, outer margin short, convex, little oblique. Hind wings ample, the outer margin convex. White, head thorax and abdominal segments more or less overspread with dark gray; the collar usually whitish; legs white. Fore wing white, marked with dark gray along all the margins, at end of cell and over discal nervules, along median vein and in a spot across submedian space, dividing the white ground into four subquadrate patches; a submarginal light shade; a faint ochereous spot at base of veins 3-4. This dark marking is variable in extent, and the white marks may be confluent. The patches at end of cell and on submedian space tend to remain darker than the other marks. Hind wing white with a trace only of two dark bands, being a faint discal bar and mark at anal angle. Below white without markings. Expanse 20 mm.

Female. Fore wings dark slaty gray, uniform, unmarked. Hind wing as in the male, with a little more gray along outer margin and the discal mark obsolete. Expanse 25 mm.

Lake Teedyuscong, Pike Co., Pa. (Clemens); Lewis Co., N. Y. (Grote); Sand L., Fourth L., Cedar L., Fox L., Urbana, Ill., June 19, 22, July 8, 22, August 4, 11 (Hart).

1 ♂, 1 ♀, Mass. (C. H. Fernald); 2 ♂, 3 ♀, on leaves of *Nelumbo*, Pine River, Lake Superior, August 18, 1896, no. 7234 (H. G. Hubbard); 2 ♂, 4 ♀ on water-lily leaves, Big Tupper Lake, N. Y., August 26, 1905 (H. G. Dyar); 1 ♂, 1 ♀, New York, nos. 9630, 15814 (Asa Fitch collection); 1 ♂, 2 ♀, Cocoanut Grove, Fla. (E. A. Schwarz).

Ab. a. ♂. Fore wings heavily black marked, the white spots reduced in size; discal band of hind wings developed across wing as a nearly straight brown-black line.

1 ♂, Hamilton, Ontario (Jas. Johnson), no. 325, in coll. Prof. C. H. Fernald.

Ab. b., foeminalis, new variety. ♂. Fore wing dark slaty gray as in the normal female with a black discal mark and one on submedian interspace. Hind wing immaculate white.

3 ♂, Palm Beach, Fla., January 25, 1900 (H. G. Dyar).

Type no. 9494, U. S. Nat. Mus.

Ab. c., masculinalis, new variety. ♀. Entirely white, the fore wing with only slight gray shading on costa, outer margin, discal and submedian spots as in the normal male.

2 ♀, Cocoanut Grove, Fla. (E. A. Schwarz).

Type no. 9495, U. S. Nat. Mus.

The larva appears to be unknown. It is probably aquatic, as the adults are taken resting on leaves of water plants and flying from one to another when disturbed, at considerable distances from shore.

Nymphula allionealis Walker.

Paraponyx allionealis Walker, Cat. Brit. Mus., xii, 458, 1859.

Hydrocampa ilealis Walker Cat. Brit. Mus., xvii, 458, 1859.

Paraponyx cretacealis Lederer, Wien. ent. Mon., vii, 484, 1863.

Paraponyx plenilinealis Grote, Pap., i, 17, 1881.

Paraponyx cretacealis Grote, New ch. list No. Am. moths, 54, 1882.

Paraponyx plenilinealis Grote, New ch. list No. Am. moths, 54, 1882.

Hydrocampa allionealis Fernald, Smith List Lep. Bor. Am. no. 4171, 1891.

Paraponyx allionealis Hart, Bull. Ill. Sta. lab. Nat. Hist., iv, 173, 1895.

Nymphula allionealis Hampson, Trans. Ent. Soc. Lond., 142, 1897.

Nymphula itealis Hampson, Trans. Ent. Soc. Lond., 142, 1897.

Nymphula plenilinealis Hampson, Trans. Ent. Soc. Lond., 142, 1897.

Nymphula allionealis Fernald, Bull. 52, U. S. Nat. Mus., no. 4491, 1903.

♂. Inner margin long, outer margin convex, not oblique. Wings white to fuscous brown, rarely pure white, more often variously tinted with yellowish brown, rarely darkly colored; lines narrow, fuscous; fringe dark spotted; a narrow terminal line; a broader slightly waved band within; an irregular oblique outer line, bent in below discal dot and pointed out on submedian fold; an obscure inner line. Hind wing with a faint inner line, discal dot, two parallel lines beyond it, a waved submarginal line and dots on fringe. Below the marks repeated more faintly. Expanse, 14 to 17 mm.

♀. Wings more pointed, outer margin straight. Marks as in the male; ground color generally white, overspread with brown as in the male but more variable than that sex. Some specimens are entirely white, the marks all obliterated although in part traceable, very faintly brown. Others are all obscured by brownish gray, the markings obliterate, even less traceable than in the white form.

Georgia (Walker); Wisconsin, September (Grote); Urbana, Ill., May 29, June 7, 29, July 6, 7, 23, 27 (Hart).

1 ♂, no. 279 coll. Prof. C. H. Fernald, compd. with type of *cretacealis*; 6 ♀, Holyoke, Mass., July 14, 27, 28, 1898 (C. H. Fernald); Florida (coll. C. H. Fernald); 2 ♀, Cayugo Co., Ohio, Chicago, Ill. (coll. W. D. Kearfott); 1 ♀, Chicago, Ill. (A. Kwiat); 14 ♂, 23 ♀, Palm Beach, Coconut Grove and Miami, Fla., March, August (Barnes, Schwarz, Dyar and Caudell).

The larva appears to be undescribed. Hart remarks that it is probably related to that of the European *strattonata*, which differs from that of *Nymphula obscuralis* Grote in the lesser development of the respiratory filaments.

Nymphula obscuralis Grote.

Oligostigma obscuralis Grote, Pap., i, 18, 1881.

Oligostigma obscuralis Grote, New ch. list No. Am. Moths, 54, 1882.

Hydrocampa obscuralis Fernald, Smith list Lep. Bor. Am., no. 4169, 1891.

Paraponyx obscuralis Hart, Bull. Ill. Sta. Lab. Nat. Hist., iv, 167, pl. 1, ff. 1-7, 1895.

Nymphula obscuralis Hampson, Trans. ent. soc. Lond., 142, 1897.

Nymphula obscuralis Fernald, Bull. 52, U. S. Nat. Mus., no. 4493, 1903.

♂. White, the fore wings shaded with blackish brown; outer line white, wavy, bent inward at median vein and obsolete, followed by a broad, dark shade; a dark half-band at middle of inner margin; base dark; terminal line black, incised subapically; fringe dark. Hind wing with slender mesial line, broad, dark outer mesial band; a broad marginal orange band with a slender dark line within and row of geminate spots without in the base of the white fringe. Expanse 17 mm.

♀. Similar. Expanse 21 to 29 mm.

N. Y., Wis., September (Grote); Urbana, Ill. (Hart).

1 ♂, Algonquin, Ill., August 22, 1904 (W. D. Kearfott); 1 ♀, Fla., no. 259 (coll. Prof. C. H. Fernald); 7 ♀, Harpers Ferry, Va., July, August, 1892, U. S. Dept. Agr. no. 4330 (T. Pergande); 1 ♀, Ohio, 1 ♀ without label (coll. U. S. Nat. Mus.).

The larva has been described by Mr. Hart. He says the favorite food of the larva is *Vallisneria spiralis* and that it has also been found upon *Potamogeton nutans*. They feed at first exposed on the leaf but later two or even three leaves are loosely webbed together face to face by each larva. The cocoon is fine and dense. Full grown larvæ and pupæ were obtained in July. Later they occurred in floating cases made by cutting loose the larval retreats and they were still to be found in September and October. The method of hibernation is not proven though a larva is recorded in December and they doubtless hibernate as larvæ in the water.

Larva. Head pale, faintly mottled, sutures light yellowish brown, setæ long, clypeus margined in front with dark brown; ocelli five with angular black pigment spots. Body whitish; tubercles normal, small, the setæ short, iv and v superposed subventrally, rather remote. Five pairs of filamentous branched gills on each side on each segment except on head, prothorax and terminal segment; the mesothorax lacks one pair, the penultimate segment lacks all but one pair, there being just 100 in all. The gills have each from three to five branches with some variation, which Hart tabulates. They increase also in number in the several stages. Hart tabulates six stages, in which the number of branches of the gills of the first four abdominal segments varies from one in stage I to six at maturity. The gills are situated: subdorsal anterior, below tubercle i; subdorsal posterior, above tubercle ii; subventral anterior, before tubercles iv + v; subventral posterior, behind tubercles iv + v; pedal, behind tubercle vi. Abdominal feet short, normal, the crochets in a wide complete ellipse.

Pupa. Spiracle-bearing segments broadest, slightly swollen dorsally, tapering gradually to each end. Rather soft bodied, pale-yellowish white, the eyes darker; smooth. Head small with two dehiscant spine-like porrect setæ on the vertex. Spiracles of segments 2 to 4 of the abdomen large and conspicuous, borne on round tubercles. Ventral sheath reaching a little beyond end of 7th segment; 9th segment beneath with a faint elevated line at middle and a small elevation on each side, the anterior margin conspicuously elevated into a broad transverse ridge bearing a row of seven sharp, brownish, short, longitudinal carinae; a Y-shaped impression beneath.

Nymphula badiusalis Walker.

Cymoriza badiusalis Walker, Cat. Brit. Mus., xix, 955, 1859.

Oligostigma curviferalis Walker, Cat. Brit. Mus., xxxiv, 1331, 1865.

Oligostigma albalis Robinson, Ann. N. Y. Lyc. nat. hist., ix, 153, 1869.

Oligostigma albalis Grote, New ch. list. No. Am. moths, 54, 1882.

Hydrocampa albalis Fernald, Smith list Lep. Bor. Am., no. 4170, 1891.

Paraponyx albalis Hart, Bull. Ill. Sta. lab. nat. hist., iv, 173, 1895.

Nymphula badiusalis Hampson, Trans. ent. soc. Lond., 142, 1897.

Nymphula badiusalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4492, 1903.

♂. Inner margin long, outer convex, not oblique. White; a marginal yellow band on both wings finely edged with fuscous. On fore wing a fuscous submarginal band; a discal ringlet with yellow spot below; a costal bar beyond, joining the ringlet and continued inwards and over submedian interspace to margin. Hind wing with two nearly straight fuscous bands. Below the markings repeated faintly. Expanse, 15 mm.

♀. The fore wings are more pointed than the male, the outer margin more oblique. The markings do not differ. Expanse, 22 mm.

Canada (Walker); N. Y., Pa. (Robinson); No. Ill. and So. Wis., June 19, August 3, 4, 9, 30, September 5, 6, 30 (Hart).

1 ♂ (coll. Prof. C. H. Fernald); 1 ♂, Va., September 16, 1880 (U. S. Dept. Agr.); 1 ♂, Ill., August 6 (Bolter); 4 ♂, 2 ♀, Washington, D. C., June 13, 1883, June and July, 1899, August 4,

1879, August 25 (Pergande, Koebele, Busck, Caudell); 1 ♀, Ohio (W. C. Metz); 1 ♂, Aurora, W. Va., August 30, 1904 (O. Heide-mann); 4 ♂, 6 ♀, Rhinebeck, N. Y., August 1885, July 27, 1887, July 8, 30, 1888, Ulster Co., N. Y., September 6, 1887, July 2, 16, 1888 (H. G. Dyar).

The larva appears to be undescribed. Hart remarks that it is "doubtless very close to" that of the preceding species. The adult is common throughout the Atlantic states and Mississippi valley, flying over water.

***Nymphula oblitalis* Walker.**

Isopteryx? oblitalis Walker, Cat. Brit. Mus., xvii, 399, 1859.

Paraponyx obscuralis Möschler, Verh. zool.-bot. Ges. Wien., 432, 1872.

Hydrocampa proprialis Fernald, Ent. Amer., iv, 37, 1888.

Hydrocampa oblitalis Fernald, Smith List Lep. Bor. Am., no. 4167, 1891.

Hydrocampa oblitalis Hart, Bull. Ill. Sta. lab. nat. hist., iv, 176, Pl. II, figs. 7-12, 1895.

Nymphula oblitalis Hampson, Trans. ent. soc. Lond., 141, 1897.

Nymphula oblitalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4496, 1903.

♂. All obscured, blackish or brown. Discal dot small, white, surrounded by a white line, which may expand into a cloud, touching costa; a faint lighter line across middle of wing and a subbasal dilution. Hind wing blackish brown with a faint mesial white line. Lighter specimens approach the female more closely in markings. Expanse 13 mm.

♀. Lighter, the marks less obscured. The ground color is overspread with blackish and ochereous; a subbasal dark line edged with white without; a median shade, black, edged with white without, expanded below, sending a black shade about the large white reniform discal spot; a subterminal black shade. Hind wing with the mesial lines pale, joining at the anal angle, enclosing a pale discal mark on a dark ground, or nearly completely overspread with brown. Expanse 28 mm.

Fla., Tex. (Fernald); Ill. (Hart).

1 ♂, 1 ♀ "from aquatic larva on water lilies" Florida, March, 1888, no. 4261 (U. S. Dept. Agriculture); 1 ♂, Texas (Boll); 2 ♂, Victoria, Texas (E. A. Schwarz); 1 ♂, 1 ♀, Somerville, S. C., April, 1899 (R. Ottolengui); 1 ♀, Palm Beach, Fla., February 4, 1900 (H. G. Dyar); 1 ♂, 2 ♀, Rhinebeck, N. Y., August 9, 1887, July 26, August 18, 1888 (H. G. Dyar); 1 ♀, West Palm Beach, Fla. (Dyar & Caudell); 2 ♂, Green Cove Springs, Fla., March (Dyar & Caudell); 1 ♂, 3 ♀, St. Louis, Mo., July 14, August 28, September 25, 1904 (H. McElhose); 3 ♀, Los Angeles, Cal. (D. W. Coquillett); 1 ♀, Fla. (coll. Prof. C. H. Fernald); 1 ♀, Texas, labelled "*Hydrocampa gyralis* Hulst, type" in Dr. Hulst's writing (coll. Prof. C. H. Fernald); 1 ♀, Claremont, Cal. (C. F. Baker).

The larva has been well described and figured by Hart. He says that the favorite home of the species is among the floating leaves of *Potamogeton nutans*. The amber-colored eggs are laid in a long band just within the margin, on the lower surface, of some broad floating leaf. They are closely placed in a single layer, in rows running parallel to the margin, the band being about 3 mm. wide and including usually five or six rows of eggs. The band is usually an inch or two long. The single egg is oval, flattened, one surface broadly gummed to the leaf, the other finely longitudinally wrinkled, a longitudinal elevated ridge at middle. Length .6 mm., width .4 mm. Young larvæ were obtained in July. The next day they had cut out minute oval disks from the leaf and webbed these to its lower surface. When a little older the larva cuts loose the portion of leaf surface to which it has attached its shelter and is thereafter found travelling about in a lens-shaped case. In larger cases the posterior end is narrowed. Full grown larvæ occurred in August, but larvæ could be found all Summer to October. The imagoes likewise occurred all the season, becoming commoner, most abundant in August and September. The method of hibernation is not stated. The young larva does not differ markedly from the mature one. Mr. Hart says that in the first stage the setæ are more conspicuous and the ocelli are closely approximate, the lower three in a solid oblong dash.

Larva. Head rather small, light brownish yellow, sutures narrowly darker, bordered on each side with whitish; a lateral brown stripe from base of head nearly to ocelli; ocelli five, their pigment spots large and confluent. Body subcylindrical, dirty whitish; cervical shield semicircular, bisected; tubercles of thorax indicated by dark rings, abdominal ones indistinct; spiracles of anterior abdominal segments more distinct, remaining ones minute and inconspicuous; ninth abdominal segment above broadly retuse, tenth feebly impressed above at middle. Abdominal feet very short, the hook-bearing area narrow, with two rows of light-colored hooks. No filamentous gills, but aquatic in habit.

Pupa. Rather rapidly narrowed behind, smooth, pale yellowish, wings and head darker. Head with two small dehiscent black spine-like porrect setæ on the vertex. Spiracles of segments 2 to 4 round, elevated, reddish brown, with a pale center and blackish ring; very large, the anterior pair much smaller. Ventral sheath reaching the seventh abdominal segment; ninth with a sharp tooth each side above lateral margin; the last two segments grooved and impressed below.

***Nymphula nomophilalis*, new species.**

Wings elongate, narrow, recalling *Nomophila noctuella* D. & S. Fore wing dark brown with a bronzy reflection, uniform in the female, lightened in two patches.

in the male, over middle of cell and beyond discal dot; two discal dots and outer and inner lines indicated in plumbeous scales, the latter excurved over cell, simple in the female, indicated by a white costal line in the male just beyond the light discal patch; a subterminal band of scattered plumbeous scales. Hind wing gray-brown, three black patches on inner margin, two faint submarginal whitish lines, most distinct before anal angle. Fore wings below unmarked, gray-brown; hind wing gray-brown with the outer lines repeated. Expanse, 20 to 22 mm.

1 ♂, 2 ♀, Hastings, Fla., April (W. D. Kearfott); 3 ♀, Charlotte Harbor, Fla., March, Lake Worth, Fla. (Mrs. Slosson) and Texas, March (coll. Prof. C. H. Fernald); 1 ♀, Cocoanut Grove, Fla. (E. A. Schwarz).

Type No. 9493, U. S. Nat. Mus.

Nymphula gyralis Hulst.

Hydrocampa gyralis Hulst, Trans. Am. ent. soc., xiii, 159, 1886.

Hydrocampa gyralis Fernald, Smith list Lep. Bor. Am., no. 4172, 1891.

Hydrocampa gyralis Hart, Bull. Ill. Sta. lab. nat. hist., iv, 175, 1895.

Nymphula dentilinea Hampson, Trans. ent. soc. Lond., 139, 1897.

Nymphula gyralis Fernald, Bull. 52, U. S. Nat. Mus., no. 4489, 1903.

♂. Wing shape the same as the female. Fore wings with the ground overwashed with ochereous and gray or entirely gray, leaving narrow white edges to the markings. Discal dot large, reniform, white, edged with black without; a black triangle with white mark without on middle of costa and spot opposite it on internal margin, both white-edged; a small spot cut by white subapically, in well-marked specimens joined to the outer edge of reniform and beneath it to the middle costal spot, a fine white line being continuous, though broken in pale specimens; a black subbasal toothed line: a terminal white line, touching margin at middle, produced inward between the veins, diffused. Hind wing nearly white, a little ochereous shaded; central lines white, diverging mesially, edged within with gray and enclosing a white discal space and a smaller one near margin; a white terminal space, followed by a dark line. Markings not sharply defined, varying to subobsolete. Expanse, 17 to 21 mm.

♀. Fore wings suffused and obscured, unicolorous, only slight traces of the markings persistent. Sordid ochereous, brown-gray or dark cinereous, very variable in color. Hind wings as in the male but more faintly marked, in white and pale gray only. Expanse, 18 to 24 mm.

Professor Fernald has sent me a specimen purporting to be one of Hulst's types of *gyralis*, but it is a ♀ of *N. oblitteralis* Walk. from Texas, a locality not mentioned by Hulst in his original description, and it is obviously a spurious type. The sexes are strongly dimorphic. Hart correctly identifies the female, of which I have many, taken in company with normal males.

Georgia, Florida (Hulst.); Urbana, Ill., June 17, July 19, August 24 (Hart); Florida (Hampson).

1 ♀, Mass. (coll. Prof. C. H. Fernald); 1 ♂, 1 ♀, Miami, Fla., (Mrs. Slosson); 1 ♂, no. 264, labelled "*Hydrocampa gyralis* Hulst, homotype" in Prof. Fernald's writing (coll. Prof. C. H. Fernald); 4 ♂, 1 ♀, Miami, Fla. (W. Barnes); 2 ♂, 2 ♀, Cocanut Grove, Fla. (E. A. Schwarz); 1 ♀, Crescent City, Fla., on blue water lily (H. G. Hubbard); 1 ♀, Palm Beach, Fla., February 16, 1900 (H. G. Dyar); 1 ♂, St. Louis, Mo., September 8, 1904 (H. McElhose); 1 ♀, Weekapaug, R. I., August 29, 1904 (H. G. Dyar); 11 ♂, 9 ♀, Big Tupper Lake, N. Y., August 26, 1905 (H. G. Dyar).

The larva appears to be undescribed. The adults occurred to me at Tupper Lake, N. Y., flying on the leaves of water lilies in company with *N. maculalis* Clem. They had evidently bred there as undeveloped specimens were seen on the leaves. Larvæ occurred on the plants in cases made of pieces of leaf, attached either to the leaf or lower down on the gelatinous stem. The larvæ were abundantly supplied with tracheal filaments as Hart describes for *Nymphula obscuralis* Grote; but it proved impossible to breed them as they hibernated in the water as larvæ, so I do not know to which species they belong.

Nymphula nebulosalis Fernald.

Hydrocampa nebulosalis Fernald, Ent. Amer., iii, 127, 1887.

Hydrocampa nebulosalis Fernald, Smith list. Lep. Bor. Am., no. 4173, 1891.

Nymphula nebulosalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4488, 1903.

Fore wing rather bright ochereous yellow, the markings black, edged with white. The markings are as in *N. gyralis* Hulst, but more diffused and partly lost in a brown shade that overspreads the terminal and central parts, leaving a broad yellow area without the discal mark; this mark is narrow, lunate; subterminal line retreating from the margin below, sometimes interrupted. Hind wing white in the middle, the base and a large discal mark yellow; mesial lines black, separating centrally to enclose the discal yellow patch; a broad yellow or fuscous yellow subterminal band; termen yellow with black line within. Legs spotted with white and fuscous yellow, Expanse, 15 to 18 mm.

This species is allied to *N. gyralis* Hulst, but the sexes are alike. It is even more nearly related to *N. icciusalis*, Walk., from which it differs only in being smaller and darker, the marks overspread with brown.

Florida (Fernald).

2 ♀, Fla. (coll. Prof. C. H. Fernald); 1 ♂, Fla. (coll. U. S.

Nat. Mus.); 1 ♂, 1 ♀, Hastings, Fla., May (G. D. Hulst); 4 ♀, Hastings, Fla., April (W. D. Kearfott).

Nothing is known of the life history.

***Nymphula icciusalis* Walker.**

Leucochroma icciusalis Walker, Cat. Brit. Mus., xix, 971, 1859.

Leucochroma faulalis Walker, Cat. Brit. Mus., xix, 973, 1859.

Hydrocampa ? *formosalis* Clemens, Proc. Acad. Nat. Sci. Phil., xii, 217, 1860.

Hydrocampa genuialis Lederer, Wien. Ent. Mon., vii, 451, 1863.

Hydrocampa genuinalis Lederer, Wien. Ent. Mon., vii, pl. 18, f. 2, 1863.

Hydrocampa pacalis Grote, Papilio, i, 17, 1881.

Hydrocampa formosalis Grote, New Ch. List No. Am. Moths, 54, 1882.

Hydrocampa formosalis Packard, Amer. Nat., xviii, 824, 1884.

Hydrocampa icciusalis Fernald, Smith List Lep. Bor. Am., no. 4174, 1891.

Hydrocampa icciusalis Hart, Bull. Ill. Sta. Lab. Nat. Hist., iv, 176, 1895.

• *Nymphula icciusalis* Hampson, Trans. Ent. Soc. Lond., 139, 1897.

Nymphula icciusalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4487, 1903.

Wings white, marked between the lines with defined areas of ochereous yellow or ochereous brown; discal mark defined without by a black line; a black line for costal triangle; a black ring for the mark on inner margin; a black subterminal line, retreating below the middle; fringes spotted with black. Hind wing with the central black lines diverging in the middle, enclosing a yellow discal patch; subterminal line fine, irregular. Expanse 15 to 23 mm.

The sexes are alike. The markings are as in *N. gyralis* Hulst and *N. nebusalis* Fernald, but well defined, the dark patches white centered and only the outlines black.

Lake Teedyuscong, Pike Co., Pa. (Clemens); Providence, R. I. (Packard); New York (Grote); Urbana, Ill., May 19, 31, June 3, 15, 26, July 5, 6, 7, 20, 21, 28, August 2, 17, 24; Lake Geneva, Wis., September 3 (Hart).

3 ♂, 5 ♀, Fla., Pa., Orono, Maine (coll. Prof. C. H. Fernald); 3 ♂, 8 ♀, N. H., Mass., N. Y., Ohio (coll. U. S. Nat. Mus.); 1 ♂ from P. C. Zeller labelled "*Hydrocampa genuinalis* Led."; 2 ♂, 2 ♀, nos. 8338, 15812, 15813 and "dugway" June 25, 1859 (coll. Asa Fitch); 6 ♀, Rhinebeck, N. Y., June 10, 11, 15, July 30, 1888 (H. G. Dyar); 1 ♂, Sandusky, Ohio, July 7, 1903 (W. C. Metz); 8 ♂, 12 ♀, Center Harbor, N. H., July 10, 1902 (H. G. Dyar).

The larva has been nominally figured by Dr. Packard. Hart mentions it as probably allied to that of *N. obliteralis* Walk. The adults fly in grass near or on the shore, not out on the water or even over the water, being easily reached with the net from dry ground. The

larvæ probably feed on water grasses rather than lilies. Dr. Packard figures a larva without tracheal filaments and gives a number of details, which it is scarcely worth while to reproduce here as his larva was not bred and may not belong to this species.

Nymphula ekthliopsis Grote.

Hydrocampa ekthliopsis Grote, Can. ent., viii, 111, 1876.

Hydrocampa ekthliopsis Grote, New ch. list, No. Am. moths, 54, 1882.

Hydrocampa ekthliopsis Fernald, Smith list, Lep. Bor. Am., no. 4175, 1891.

Hydrocampa ekthliopsis Hart, Bull. Ill. Sta. lab. nat. his., iv, 176, 1895.

Nymphula ekthliopsis Hampson, Trans. ent. soc. Lond., 139, 1897.

Nymphula ekthliopsis Fernald, Bull. 52, U. S. Nat. Mus., no. 4490, 1903.

Body white, the thorax spotted with black, the abdominal segments banded. Wings ochraceous yellow; a subbasal white band edged with black; a small white dot in cell, black-edged; a white triangle on costa opposite to, and sometimes confluent with a round mark on inner margin, black-edged; discal spot large, round, joined to costa, black-edged; subterminal line white, lunate within, black-edged without; fringes spotted. Hind-wing white, black central lines remote and rather straightened, the inner with a yellow basal edge; discal mark reniform, yellow, black-edged, subdivided; beyond outer line a yellow area terminated in a dentate black line; margin yellow, edged with black lines. Expanse, 20 to 25 mm.

The species is allied to *N. icciusalis* Walk., but the markings are further modified in the same direction and are more ornate and distinct. The sexes are alike.

Albany, N. Y. (Grote); Champaign, Ill., July 5 (Hart).

1 ♀, Amherst, Mass., "homotype" (C. H. Fernald); 1 ♀, Western Manitoba (A. W. Hanham); 15 ♂, 18 ♀, Center Harbor, N. H., June 23, 25, 1902 (H. G. Dyar).

The larva is unknown. I took the adults commonly flying over water in reeds at the shore of the lake in company with *N. icciusalis* Walk., but further out, so that they could not be reached from dry ground.

Genus OLIGOSTIGMA Guenée.

Oligostigma Guenée, Spec. Gen., viii, 260, 1854.

Oligostigma Hampson, Trans. ent. soc. Lond., 167, 1897.

Palpi upturned, the second joint moderately fringed with hair in front and reaching vertex of head, the third well developed and acuminate; maxillary palpi long and dilated with scales at extremity; frons rounded; antennæ of male usually annulated; ocelli rarely prominent; legs long, the tibiæ smooth, with the spurs almost equal. Fore wing with veins 3, 4, 5 from angle of cell; 7 straight and well separated from 8, 9, 10. Hind wing with the cell about half the length of the wing; veins 3, 4, 5 from angle; 6, 7 from upper angle; 7 strongly anastomosing with 8; the outer margin excised below apex, then lobed (Hampson).

Synopsis of Species.

Outer margin of hind wings with a slight subapical indentation.....*seminealis*.
 Outer margin of hind wing distinctly indented subapically, crenulate.....*vittatalis*.

Oligostigma seminealis Walker.

Oligostigma seminealis Walker, Cat. Brit. Mus., xvii, 430, 1859.

Eustales tedyuscongalis Clemens, Proc. Acad. Nat. Sci., Phil., xii, 216, 1860.

Paraponyx tedyuscongalis Grote, New ch. list No. Am. moths, 64, 1882.

Oligostigma semineale Hampson, Trans. Ent. Soc. Lond., 167, 1897.

Oligostigma juncealis Fernald (not Guenée), Bull. 52, U. S. Nat. Mus., no. 4502, 1903.

♂. Fore wing fuscous, shaded with ochereous; a white outer band bent at right angles inward in submedian space, becoming obscure on inner part; a faint black discal mark and median shade; a narrow white submarginal line with a black hair-line without; margin fulvous. Hind wing white; a median straight black band; an outer broader band separated from the fuscous margin by a narrow white line, partly replaced by fulvous at apex and center of outer margin. Small black spots on margin with minute pupils. Below as above, slightly fainter. Expanse 18 mm.

♀. Unknown.

This species has been erroneously referred in our lists to *O. juncealis* Guen. from South America. The two species are really distinct. I have a fine series of the true *juncealis* from Brazil and the Guianas (W. Schaus).

Lake Teedyuscong, Pike Co., Pa. (Clemens).

1 ♂, Cocanut Grove, Fla. (E. A. Schwarz).

Oligostigma vittatalis, new species.

Body brown with whitish on sides of thorax and abdominal rings. Fore wings silvery white; basal third dark brown, cut by a white subbasal line and one just at edge, cutting off a linear dark inner line; outer line linear, dark, curved to below cell, then straight to margin, the curve to costa filled in with dark over the discal mark, which shows obscurely as two parallel darker lines. A broad subterminal shade, separated by white from the outer line and terminal dark shade, the latter narrow, sinuous; fringe spotted black and white with a black basal line. Hind wing marked in the same manner, the outer line a little less decidedly bent, the terminal shade enclosing faint orange shading at the margin. Expanse, 14 to 18 mm.

2 ♂, Biscayne Bay, Fla. (Mrs. Slosson); Hastings, Fla., April (W. D. Kearfott),

Type no. 9496, U. S. Nat. Mus.

The species resembles in appearance *Diasemia ramburialis* Dup.

Genus *AMBIA* Walker.

Ambia Walker, Cat. Brit. Mus., xix, 957, 1859.

Opistheideicta Warren, Ann. Mag. Nat. Hist. (6), v, 478, 1890.

Oligernis Meyrick, Trans. Ent. Soc. Lond., 470, 1894.

Leucogephyra Warren, Ann. Mag. Nat. Hist. (6), xviii, 219, 1896.

Ambia Hampson, Trans. Ent. Soc. Lond., 159, 1897.

Palpi upturned, the second joint reaching vertex of head and nearly naked, the third long and acuminate; maxillary palpi filiform and of moderate length; frons rounded; legs of moderate length, the spurs long and equal. Fore wing with the apex slightly produced, the outer margin somewhat excised below apex; veins 3, 4, 5 usually from angle of cell; 7 straight and well separated from 8, 9, 10. Hind wing with the apex produced, the outer margin somewhat excised below apex and with two excisions towards anal angle; the inner margin very short; veins 3, 4 from angle of cell; 5 usually from somewhat above angle; 6, 7 from upper angle (Hampson).

Ambia striatalis, new species.

Shining white; all the interspaces of both wings from middle to margin broadly streaked with brown. Fore wing subfalcate at apex, margin crenulate; hind wing sharply crenulate, excavate opposite cell and at anal angle. Fore wing brown at base, the disk white, confusedly shaded in dull ocher; a white line from costa at outer fourth, bent in below cell and reaching margin at middle, obscured by a brown shade, the space beyond streaked in brown. Hind wing white at base; a mesial brown band, enclosing near its edges on each side a white line, the outer of which is roundly waved; space beyond to margin brown streaked. Expanse, 18 to 20 mm.

1 ♂, 1 ♀, Charlotte Harbor, Fla., March (Mrs. Slosson).

The types are in the collection of Prof. C. H. Fernald.

Genus *ELOPHILA* Hübner.

Elophila Hübner, Tentamen, 2, 1806.

Cataclysta Hübner, Verz. bek. Schmett., 363, 1827.

Chrysandeton Grote, Pap., 1, 16, 1881.

Anydraula Meyrick, Trans. Ent. Soc. Lond., 427, 1885.

Cataclysta Hampson, Trans. Ent. Soc. Lond., 147, 1897.

Palpi upturned, the second joint reaching vertex of head and slightly fringed with hair in front, the 3d long and acuminate; maxillary palpi small and filiform; frons rounded; antennæ annulate with rings at the joints; legs long and slender, the spurs long and nearly equal. Forewing with veins 3, 4, 5 from angle of cell; 7 straight and well separated from 8, 9, 10. Hind wing with veins 3, 4, 5 from angle of cell; 6, 7 from upper angle or stalked (Hampson).

Synopsis of Species.

Hind wings without a black powdered space between disk and termen.

Both wings dark gray; hind wings with submarginal line.....**brunnildalis**.

Ground color white; no continuous submarginal line.

Hind wings with a black costo-discal bar**bifascialis**.

Hind wings without such a bar**drumalis**.

Hind wings with such a black powdered space.

Fore wings with the subterminal silvery bar narrowing to apex or detached; silvery spots on wing rounded, separate.

- An angular white spot above middle of inner margin.....**claudialis**.
 This spot not present.....**slossonalis**.
 Fore wing with the subterminal mark a costo-apical dash diminishing below;
 markings of confused lines.
 Fore wing with defined silvery white patches, especially an angular one
 above inner margin; marginal dots of hind wings pupilled.....**magnificalis**.
 Fore wing variable but without this patch; marginal dots of hind wing not
 ocellate.
 Hind wing with a white area before the marginal dots.
 Small; no yellow beyond mesial line on hind wing.....**fulicalis**.
 Larger; a yellow extra-mesial bar.....**cronialis**.
 Hind wings all dark gray to the margin.....**schæfferalis**.

Elophila brunnilialis, new species.

Fore wings dark brown, lighter in median space and about anal angle; no lines visible on basal portion: inner line near middle, dark, slender, slightly waved, narrowly separated from the basal dark area by a light space; outer line at outer third, erect, dentate, slender, dark, relieved without by a light space; there is a faint indication of a line from its middle towards outer margin, being the remains of the out-curve seen in *onyxalis* Hampson, but here almost completely obsolete; an illy defined pale submarginal line. Hind wings sordid gray, darker before antemesial pale area, which limits a faint mesial dark wavy line that joins the discal ringlet; space beyond gray without any black scaling; marginal black spots from apex to middle in a gray field, with some metallic scales, edged within by a slender wavy black line, that runs submarginally to anal angle. Expanse, 18-22 mm.

Three ♀♀, Walters Station, California, April, from Mr. W. D. Kearfott, presumably collected by G. H. Huston; one type in the U. S. National Museum, two in Mr. Kearfott's collection.

Type no. 9784, U. S. Nat. Mus.

Elophila bifascialis Robinson.

Cataclysta bifascialis Robinson, Ann. Lyc. Nat. Hist. N. Y., ix, 154, 1869.

Cataclysta bifascialis Grote, New ch. list No. Am. moths, 54, 1882.

Cataclysta bifascialis Fernald, Smith, list. Lep. bor. Am., No. 4156, 1891.

Cataclysta bifascialis Hampson, Trans. Ent. Soc. Lond., 149, 1897.

Elophila bifascialis Fernald, Bull. 52, U. S. Nat. Mus., No. 4499, 1903.

Wings long and narrow; fore wing finely powdered with black on a white ground; a mesial ochereous band edged with gray, cut by a white line on costal half; four other bands occupying distal third of wing, converging on tornus and separated apically by two white wedge-shaped marks; the subterminal one shades below into metallic scales; fringe gray. Hind wing white; a terminal series of round black spots edged with a metallic terminal line; a costo-discal black bar, submaculate, resting on a sordid costal area; a discal orange mark bordered basally and outwardly by an oblique gray bar with metallic sheen; inner area white with a gray spot above tornus. Expanse 12 to 18 mm.

Texas (Robinson).

4 specimens, one labelled Texas (coll. Prof. C. H. Fernald); 17, Texas (Belfrage); Victoria, Texas, March 22, 27, 31 (E. A. Schwarz); Kerville, Tex. (W. Barnes); Roswell, N. Mex., August 22 (T. D. A. Cockerell); Harpers Ferry, Va., August 29, 1888 (T. Pergande); Plummer's Island, Md. (A. Busck).

Ab. a. The fore wings are reddish brown, obscuring the markings.

Texas.

Ab. b. The costo-discal bar of hind wings is light bluish gray, edged with black.

Texas.

Ab. c. kearfottalis, new variety. Hind wings with the black bar replaced by two wavy black lines, filled by the white ground color; a broken black line between this and the outer marginal spots in three of the specimens.

3, Phoenix, Arizona, May (R. E. Kunzé); 1, without label (coll. W. D. Kearfott).

Type no. 9637, U. S. Nat. Mus.

I have seen no reference to the larva of this species.

Elophila drumalis, new species.

Silvery white; fore wings shaded with pale ocher, leaving two outer lines which converge toward tornus; a broad inner yellowish band. Hind wing with a pale yellow inner spot and a discal one; outer margin with the black spots diffused, separated by metallic scales, duplicated within by a series of short black lines. Expanse 10 mm.

1 ♀, Fort Drum, Florida (U. S. Dept. Agr.).

Type no. 9491, U. S. Nat. Mus.

Elophila claudialis Walker.

Cataclysta claudialis Walker, Cat. Brit. Mus., xvii, 437, 1859.

Cataclysta medicinalis Grote, Pap., i, 15, 1881.

Chrysandeton medicinalis Grote, new ch. list No. Am. moths, 54, 1882.

Chrysandeton claudialis Fernald, Smith list Lep. bor. Am., no. 4153, 1891.

Chrysandeton claudialis Hart, Bull. Ill. Sta. lab. nat. hist., iv, 174, 1895.

Cataclysta medicinalis Hampson, Trans. ent. soc. Lond., 149, 1897.

Cataclysta claudialis Hampson, Trans. ent. soc. Lond., 151, 1897.

Elophila claudialis Fernald, Bull. 52, U. S. Nat. Mus., no. 4498, 1903.

Fore wings brown-gray; a white subbasal band narrowed to costa; a rounded triangular white patch in centre of wing; an oblique mark from outer third of costa; a subterminal white line, not attaining anal margin angle; a terminal yellow line. Hind wing white; a mesial brown-gray band narrow centrally, subfurcate on costa; containing a small ocherous space; disk powdered with black scales; a terminal row of round black spots with some metallic scales, set in a yellow margin. Expanse 11, to 13 mm.

"United States" (Walker); Carbondale, Ill. (Grote); Champagne, Ill., June 21 (Hart).

9 specimens, Central Mo., Fla. (coll. Prof. C. H. Fernald); 3, North Carolina (Morrison); Tryon, N. C. (W. F. Fiske); 2, Washington, D. C. (coll. C. V. Riley); 2, D. C., July 1 (A. Busck); Hastings, Fla., June (G. D. Hulst); Fort Drum, Fla. (U. S. Dept. Agr.); Pittsburgh, Pa., July 8, 1905 (H. Engel).

Ab. a. Smaller and darker, the white marks reduced in size, the outer oblique mark narrow or absent.

Hastings, Fla.

The larva is undescribed.

Elophila slossonalis, new species.

Fore wing brown-gray; a broad straight subbasal band, white or light brown suffused; an outer fine pale line, oblique from costa; sharply angled inward, then oblique again to inner margin near tornus; subterminal band straight, white above, metallic below; terminal space faintly orange. Hindwing whitish, a dark clouded mesial band containing an orange discal mark; disk powdered with black scales; terminal black spots separated by metallic scales, set in a faintly orange terminal area. Expanse, 13 mm.

This is not improbably *E. guenealis* Snellen (*Paraponyx guenealis* Snellen, Tijds. voor Ent., xviii, 260, 1875) described in an article on the Pyralidæ of New Grenada, St. Thomas and Jamaica; but the white band is quite obscured in Snellen's figure and there are a number of differences in detail. I prefer therefore, to hold our form separate, at least until the receipt of specimens from the West Indies.

4 specimens, Charlotte Harbor, Florida, March (Mrs. Slosson); Glenwood, Fla. (Dr. Barnes), all from Prof. C. H. Fernald's collection.

Elophila magnificalis Hübner.

Pyralis magnificalis Hübner, Eur. Schmett., vi Horde, die Zünsler, 18, 1776, Pl. 16, f. 104, 1796.

Cataglyphis lamialis Walker, Cat. Brit. Mus., xvii, 436, 1859.

Cataglyphis ? heliopalus Clemens, Proc. Acad. nat. sci. Phil., xii, 218, 1860.

Chrysandeton heliopalus Grote, New ch. list no. Am. moths, 54, 1882.

Chrysandeton lamialis Fernald, Smith list Lep. bor. Am., no. 4154, 1891.

Cataglyphis magnificalis Hampson, Trans. ent. soc. Lond., 149, 1897.

Elophila magnificalis Fernald, Bull. 52, U. S. Mat. Mus., no. 4497, 1903.

Ground color of wings silvery white with gray-brown lines; a subcostal streak to three fourths; a faint inner line closely followed by a distinct one that sends a bar in cell to the very irregular outer line; this starts on costa at end of subcostal bar,

runs obliquely nearly to tornus, then returns to discal dot, bends again to an angle on vein 1c and ends on middle of inner margin; a gray line from costa before apex to middle of outer margin; a subterminal gray line; termen pale ochereous; an ochereous line from tornus into the loop of outer line, edged with gray. Hind wings with inner and outer mesial gray lines; disk strigose dotted with black; terminal black spots large, metallic pupilled, set in a pale ochereous field. Expanse, 23 mm.

"England" (Hübner) [an error]; "United States" (Walker); Lake Teedyuscong, Pike Co., Pa. (Clemens).

4 specimens, Amherst, Mass., Orono, Maine (coll. Prof. C. H. Fernald).

The larva is unknown.

***Elophila fulcalis* Clemens.**

Cataclysta fulcalis Clemens, Proc. acad. nat. sci. Phil., xii, 217, 1860.

Cataclysta angulatalis Lederer, Wien. ent. Mon., vii, 486, 1863.

Cataclysta confusalis Walker, Cat. Brit. Mus., xxxiv, 1334, 1865.

Chryseudeon avernalis Grote, Trans. Kans. acad. sci., viii, 53, 1878.

Cataclysta fulcalis Grote, New ch. list No. Am. moths, 54, 1882.

Cataclysta avernalis Fernald, Smith list Lep. bor. Am., no. 4157, 1891.

Cataclysta fulcalis Hampson, Trans. ent. soc. Lond., 149, 1897.

Elophila fulcalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4500, 1903.

Fore wing gray with white lines; two costal streaks converge toward tornus; two inner transverse lines, a discal spot and rounded area on middle of inner margin, all white. Hind wings white; a mesial broad gray band; disk powdered with dark scales, with a fine gray line limiting this area within; terminal black dots separated by metallic scales in a yellow field. Expanse, 12 to 15 mm.

Marked after the pattern of *E. magnificalis*, but the white marks reduced or obsolete, the black dots of hind wing not pupilled.

Easton, Pa. (Clemens); "North America" (Walker); New Mexico (Grote).

20 specimens, Amherst, Mass., Chicopee, Mass. (coll. Prof. C. H. Fernald); 8, Texas; 2, Hot Springs, Arizona, cotypes of *avernalis* Grote (coll. Fernald); Montclair, N. J., June 9, 1899 (W. D. Kearfott); 10, N. H. (coll. U. S. Nat. Mus.); Columbus, Ohio, May 25 (W. C. Metz); Plainfield, N. J. (Mrs. F. O. Herring); New Brighton, Pa., August 20, 1902 (H. D. Merrick); 2, New York, nos. 2819 and "dugway" June 25, 1859 (coll. Asa Fitch); Victoria, Tex., March 31 (E. A. Schwarz); 25, Plummer's Island, Md., June, August (A. Busck); Salem, Oregon, June 26, 1898 (T. Kincaid); Pullman, Wash., August 9, 1898 (C. V. Piper).

Ab. a. avernalis Grote. White marks of fore wing lost except subapically, the inner bar continued across wing as a fine flexuous line.

Ab. b. White markings absent except subapically, the wing varied with blackish lines and dottings.

Archer, Fla., March 9, 1882 (A. Koebele); Fla. (coll. C. H. Fernald).

Ab. c. Larger; orange-ocherous patches interposed between the white terminal marks and in the discal band of hind wings. Expanse, 18 to 28 mm.

Shovel Mt., Texas (W. Barnes); Sonora, Mexico, 40 miles from Arizona line (Morrison); 4, Phoenix, Ariz., April, May (coll. W. D. Kearfott).

The larva is unknown.

***Elophila cronialis* Druce.**

Cataclysta cronialis Druce, Biol. Cent.-Am., Lep. Het, ii, 274, 1896.

Cataclysta cronialis Hampson, Trans. ent. soc. Lond., 149, 1897.

Marked like *E. fulicatis*, but very much larger, the middle band of fore wings and space between outer white lines marked with ocher. Hind wings with an ocher bar between the basal shading and outer powdery area before the discal dot. Expanse, 27 to 30 mm.

Jalapa, Mexico (Druce).

2 ♀, Nogales, Arizona, May; Huachuca Mts., Ariz. (Dr. Barnes).

***Elophila schaefferalis*, new species.**

Similar to *cronialis* Druce, but much darker. Head and body blackish slate gray, black and white scales mixed. Wings dark gray, black scales densely and uniformly irrorate on a white ground. Basal area of fore wings dark; median line angled outward on median vein, narrowly separated from the dark basal area; outer line narrow, dark, faint, curved from costa to tornus whence it sends an obscure loop to just below the clouded discal ringlet; a curved, black subapical band, widest on costa; apex whitish; a black submarginal line, the margin sordid orange. Hind wing without any white spaces, all solidly irrorate with black; base dark, intensified discally; mesial line slender, black, curved, indented on submedian fold, running to anal angle; a small outer discal dot, black, followed by white scales; marginal black marks small, pointed, relieved by sordid orange within and separated by metallic scales. Expanse, 27 mm.

One female, Palmerlee, Cochise Co., Arizona (C. Schaeffer).

The type is in the Museum of the Brooklyn Institute.

Genus GESHNA, new.

Palpi upturned, the third joint long and acuminate; maxillary palpi slender smooth, moderate; frons rounded; antennæ with the shaft annulate. Fore wings with veins 7 and 10 stalked. Hind wings with the outer margin curved, bent at a slight angle in the middle.

Type, *G. cannalis* Quaint.

Synopsis of Species.

Fore wings light brown with a white discal dot.....**cannalis**.
 Fore wings yellowish white with complicated dark brown lines**primordialis**.

Geshna cannalis Quaintance.

Hydrocampa cannalis Quaintance, Bull. 45, Fla. Exp. Sta., 68, 1898.

Nymphula cannalis Dyar, Proc. Ent. Soc. Wash., iv, 463, 1901.

Nymphula cannalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4494, 1903.

Entirely buff-brown, a little purplish-tinted; a quadrate white discal dot with a black dot on inner side and cusp without; inner line fine, black, strongly excurved on median vein; outer punctiform, dentate, regularly outcurved. Hind wing with a fine dentate outer line, somewhat digitately projected on middle segment, the inner segment sharply retracted to lie in line with the discal dot; a fine terminal dark line and line in fringes on both wings. Below paler; fore wings with discal dot as above, but more distinct and with an oblique black line below it; outer line punctiform, slight, bent at an angle on costa. Hind wing with discal dot and outer line, the latter punctiform-dentate, not dislocated. Expanse 18 to 24 mm.

This species probably occurs in the West Indies, but I have not as yet seen a previous description of it.

Florida (Quaintance).

2, Lake City, Fla., November 25, 1896 (A. L. Quaintance); 13, Palm Beach, Fla., February and March, 1900 (H. G. Dyar); 2, Fla. (coll. Prof. C. H. Fernald).

The larva has been fully described by Quaintance as the "Canna leaf roller." He says that the larvæ were injurious to *Canna indica* at Lake City by rolling the leaves and eating out the parenchyma from the inner (upper) side of the leaves. I have observed the same injury to the wild *Canna* at Palm Beach.

Egg. Slightly longer than broad; even outline, very flat; clear whitish yellow; surface with irregular hexagonal lines. Size .85 × .93 mm. Laid in patches of six to fifteen.

Stage I. Head cordate, yellow, eyes brown. Body cylindrical, slightly tapering, yellowish, somewhat transparent; abdominal feet with a single row of brownish hooks. Tubercles normal, very small, annular; setæ large and stout with slightly swollen tips, normal (seta iib of the thorax is not shown in the figure, but should be present; it is probably so small that the artist overlooked it), primary ones only present, iv and v of abdomen approximate, superposed.

Stage VI. Head cordate, yellow, clypeus yellowish brown, jaws brownish black; width 1 mm. Body cylindrical, tapering somewhat to the ends, yellowish white, transparent, greenish from the contents of the alimentary canal. Abdominal legs with a circle of stout brown hooks. Tubercles normal, subprimary ones present, the tubercles of thorax and i to iii of abdomen expanded into large plates; ia + ib,

ii + iib and iv + v on thorax, iv and v closely approximated and superposed on abdomen.

Pupa. Chocolate brown, abdomen somewhat lighter, cremaster eight stout, dark brown hooks; length, 11.5 mm.

***Geshna primordialis*, new species.**

Wings pale yellowish, more or less largely, often largely overspread with dark brown; lines dark brown, the inner slightly flexuous; discal ringlet subreniform; outer line straight to end of cell, strongly excurved to near margin above tornus, retreating below discal ringlet and reaching inner margin at middle. The brown shading fills up nearly all the space between the marks, but leaves a light edge within the inner line, beyond the outer, and before the discal ringlet. Hind wing with the base to inner line brown; a light space in which are three irregular discal spots partly or wholly fused to the outer line by dark shading; terminal area broadly dark; fringe interlined with pale. Expanse, 12 to 15 mm.

This species is common in the Northern Atlantic states, and I can only account for my failure to find any previous description of it, by its great similarity to *Blepharomastix stenialis* Guen., which may have caused it to be overlooked. It differs superficially from that species only in being smaller, although it is usually much darker shaded.

N. Ill. (A. Bolter); Hazelton, Pa., August 5, 1895 (W. G. Dietz); 4, Essex Co. Park, N. J., June 13, 1899 (W. D. Kearfott); 2, Greenwood Lake, N. J., June 10, 1900 (W. D. Kearfott); Delaware Co., Pa., July 1, 1900 (W. D. Kearfott); 21, Center Harbor, N. H., June 24, July 9, 1902 (H. G. Dyar); 2, Quebec and Ontario (A. W. Hanham); Maine (A. S. Packard); St. Louis, Mo., June 2, 1877 (C. V. Riley); 2, St. Louis, Mo., August 1 to 7, 1904 (H. A. McElhose); Eufala, Alabama (C. V. Riley); Texas (Boll); 3 Louisiana, Mo. (G. M. Dodge); Tryon, N. C., September 5 (W. F. Fiske).

Type no. 9492, U. S. Nat. Mus.

Genus DIATHRAUSTA Lederer.

Diathrausta Lederer, Wien. ent. Mon., 438, 1863.

Diathrausta Hampson, Trans. ent. soc. Lond., 205, 1897.

Palpi porrect, triangularly scaled, the third joint hidden by hair; maxillary palpi dilated with scales; frons rounded; antennæ annulated and ciliated; tibiæ with the outer spurs two thirds the length of the inner. Fore wing with veins 3, 4, 5 from angle of cell; 7 well separated from 8, 9, 10. Hind wing with the cell about half the length of the wing; vein 4 absent; 6, 7 from upper angle (Hampson).

***Diathrausta reconditalis* Walker.**

Hymenia reconditalis Walker, Cat. Brit. Mus., xix, 943, 1859.

Ædiodes minualis Walker, Cat. Brit. Mus., xxxiv, 1297, 1865.

Diathrausta octomaculalis Fernald, Ent. Amer., iii, 127, 1887.

Diathrausta pisusalis Fernald (not Walker), Smith list Lep. bor. Am., no. 3985, 1891.

Diathrausta reconditalis Hampson, Trans. ent. soc. Lond., 205, 1897.

Diathrausta reconditalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4503, 1903.

Brownish black; inner line curved, ochereous; outer excurved over cell, sometimes broken, ochereous; three quadrate white dots in the position of reniform, orbicular and claviform; fringe white, black patched at middle of margin. Hind wing with round white discal spot; outer line ochereous above, white towards inner angle. Expanse 15 to 18 mm.

New York (Walker); Pa., N. Y., Ont., July 3, 1886 (Fernald).

No. 253 (coll. Prof. C. H. Fernald); Watchung Mts., N. J., June 19, 1899 (W. D. Kearfott); New Brighton, Pa., September 29, 1902 (H. D. Merrick); New Haven, Conn. (A. H. Verrill); Ft. Collins, Col., August 9, 1898 (C. P. Gillette); Chimney Gulch, Golden, Col., July 15, 1904 (E. J. Osler); Las Vegas Hot Springs, New Mexico (Schwarz & Barber); Santa Rita Mts., Pima Co., Arizona (O. C. Poling).

Genus *PILETOCERA* Lederer.

Piletocera Lederer, Wien. Ent. Mon., 431, 1863.

Piletocera Hampson, Trans. ent. soc. Lond., 209, 1897.

Palpi upturned, the second joint moderately fringed with scales in front and reaching vertex of head, the 3d obtuse; maxillary palpi extremely minute; frons rounded; antennæ of male (in our species) normal and ciliated; tibiæ with the outer spurs two thirds the length of inner. Fore wings with veins 3, 4, 5 from angle of cell; 7 well separated from 8, 9, 10. Hind wing narrow, the cell short; veins 3, 4, 5 from angle, 6, 7 from upper angle.

Hampson places under *Piletocera* eight other genera which differ in the modifications of the male antennæ. He recognizes them as subgenera. Section VIII, in which he puts our species, has no name and, on the usual supposition that these secondary sexual characters are of generic value, it appears that our species is without a genus. I am, however, retaining it in *Piletocera*. This genus has the antennæ of male with a slight tuft and distortion at middle, the fore wing with a small postmedial lobe on costa, the membrane distorted; legs naked.

Piletocera bufalis Guenée.

Stenia bufalis Guenée, Spec. Gen., viii, 245, 1854.

Botys stercoralis Möschler, Verh. z.-b. Ges. Wien., xxxi, 419, 1881.

Piletocera bufalis Hampson, Trans. ent. soc. Lond., 214, 1897.

Stenia bufalis Druce, Biol. Cent.-Am., Lep. Het., ii, 561, pl. 101, f. 21, 1899.

♂ with a fovea in the cell, the wings slightly distorted. Dark gray-brown, lines blackish; inner line wavy, obscure; discal dot a squared ringlet; outer line dentate, excurved over cell, edged without with whitish. Hind wing lighter, the mesial line produced outward on central segment, faintly darker, edged without with pale; traces of a discal dot. Expanse, 14 to 20 mm.

Cayenne, French Guiana (Guenée); Paramaribo, Dutch Guiana (Möschler); Panama (Druce).

4 ♂, 3 ♀, Charlotte Harbor, Lake Worth and Miami, Fla. (Mrs. Slosson, in coll. Prof. C. H. Fernald); 10 ♀, Miami, Fla. (W. Schaus); 9 ♀, Cayenne, French Guiana (W. Schaus).

Genus STENIODES Snellen.

Steniodes Snellen, Tijd. voor. Ent., xviii, 244, 1875.

Stenia Hampson (in part), Trans. ent. soc. Lond., 206, 1897.

Palpi porrect, triangularly scaled, the third joint hidden by hair; maxillary palpi dilated at extremity; frons rounded; antennæ of male thickened and bearing a tuft of hair at one fourth from base; fore wing with vein 3 from before angle of cell; 4, 5 from angle; 7 straight and well separated from 8, 9, 10. Hind wing with the cell about half the length of the wing; vein 3 from before angle; 4, 5 approximated for a short distance; 6, 7 from upper angle.

Steniodes gelliasalis Walker.

Botys gelliasalis Walker, Cat. Brit. Mus., xix, 988, 1859.

Steniodes lutealis Snellen, Tijd. voor. Ent., xviii, 245, 1875.

Stenia gelliasalis Hampson, Trans. ent. soc. Lond., 207, 1897.

Of the color and markings of *Pileocera bufalis* Guen., and easily confused therewith. The palpi are straight and porrect and white on the lower half, while in *bufalis* they are curved, though short, and are dark below. Wings squarer and more trigonate than in *bufalis*, the lines a little more delicate and less contrasted. Hind wing nearly uniformly dark, the marks obliterate. Expanse, 13 to 15 mm.

Rio Janeiro, Brazil (Walker); West Indies (Snellen).

1 ♀, Lake Worth, Florida (Mrs. Slosson); 1 ♀, Jamaica (W. Schaus); 1 ♀, Grenada, B. W. I. (W. Schaus); 1 ♀, Brownsville, Texas, Los Borregos, June 5, 1904 (H. S. Barber).

Subfamily SCOPARIINÆ.

Proboscis present; palpi porrect and hairy, the maxillary palpi dilated with long hairs. Fore wings with more or less developed tufts of raised scales in the cell; vein 7 from cell, 10 from cell. Hind wing with the median nervure non-pectinate.

Genus SCOPARIA Haworth.

Scoparia Haworth, Lep. Brit., 491, 1803.

Eudorea Curtis, Brit. Ent., vi, 170, 1825.

Lissophanes Warren, Ann. Mag. Nat. Hist., (6) viii, 67, 18.

Scoparia Hampson, Trans. ent. soc. Lond., 229, 1897.

Palpi porrect; maxillary palpi triangularly scaled; front flat; antennæ minutely ciliated; tibiæ with the outer spurs about two thirds the length of the inner. Fore wing with vein 3 from before angle of cell, 4, 5, from angle, 7 well separated from 8, 9, to which 10 is approximated towards origin. Hind wing with 3 from before angle of cell, 4, 5 from angle or stalked, 6, 7 shortly stalked.

The larvæ are all unknown.

Synopsis of Species.

Outer line straight, at least not excurved mesially.

Dark gray *rectilinea*.

Pale, almost white..... *expallidalis*.

Outer line excurved over discal nervules.

Inner line arcuate.

Large species, expanse over 25 mm.

Subterminal line obsolete or as a limit to the lighter terminal area only.

♀ darkly shaded, marks obscured..... *centuriella*.

♀ light gray, marks distinct..... *normalis*.

Subterminal line defined, yellowish, sinuate..... *delphusa*.

Small species, expanse less than 25 mm.

Wing dark brown-gray, lines pale, faint..... *penumbralis*.

Markings relieved, lines in part black.

Wing with a broad contrasting pale median space.

Outer line nearer reniform than margin..... *cinereomedia*.

Outer line nearer margin than reniform. *schwarzalis*.

Median space, if pale, not contrasted, general effect unicolorous.

Spots all short black streaks..... *strigalis*.

Spots; at least in part, annular or cuspidiform.

Orbicular and reniform united by a longitudinal bar or ellipse..... *lugubralis*.

Stigmata separate.

Larger; outer line sharply and widely outcurved for half its length..... *tricoloralis*.

Smaller; outer line slightly and irregularly outcurved in the middle..... *basalis*.

Inner line straight, strongly oblique..... *torniplagalis*.

Scoparia rectilinea Zeller.

Scoparia rectilinea Zeller, Verh. zool.-bot. Ges. Wien., xxiv, 427, 1874.

Scoparia refugalis Hulst, Trans. Am. ent. soc., xiii, 148, 1886.

Scoparia refugalis Fernald, Smith's list Lep. Bor. Am., no. 4130, 1891.

Scoparia rectilinea Fernald, Smith's list Lep. Bor. Am., no. 4131, 1891.

Scoparia rectilinea Hampson, Trans. ent. soc. Lond., 234, 1897.

Scoparia rectilinea Dyar, Proc. U. S. nat. mus., xxvii, 918, 1904.

Dark gray; inner line curved, narrowly black with pale inner edge, fused to the linear small black claviform; orbicular a small obscure ellipse; reniform two black cusps joined by a bar; outer line black, straight, bent inward a little below costa; terminal space black, cut by a diffused gray subterminal line, bent in the middle; a row of terminal black dots. Hind wings gray with faint submarginal pale line. Expanse, 17-20 mm.

Vancouver Is. (Zeller); California (Hulst).

1, labelled "*Scoparia refugalis* Hulst, homotype" (Coll. Prof. C. H. Fernald); 175, Kaslo, B. C., July, August (H. G. Dyar); 1, Shawnigan Lake, B. C., August 29 (H. G. Dyar); 1, Los Angeles, Cal. (D. W. Coquillett); Wellington, B. C. (G. W. Taylor); 27, San Louis Obispo, Cal. (A. H. Vatchell, in coll. W. D. Kearfott).

Scoparia expallidalis, new species.

Fore wings very pale gray, nearly white, thin and delicate; inner line faint curved, pale brown, attached to the small, black, linear claviform; orbicular a brown ringlet; reniform of two cusps with a bar below; outer line narrow, dark and straight, without excurve, separated narrowly from a brown shade that runs to margin, cut only by the white subterminal line, which is incurved at middle; fringe maculate. Hind wings subpellucid white, gray tinted, relieving a white submarginal band faintly. Expanse, 20 mm.

6, Verdi, Nevada, June 10, 20, 30 (A. H. Vatchell, in coll. W. D. Kearfott).

Type no. 9633, U. S. Nat. Mus.

Scoparia centuriella Schiffermiller.

Tinea centuriella Schiffermiller, Syst. Verz. Wien., 319, 1776.

Eudorea borealis Lefebvre, Ann. ent. soc. Fr., 400, 1836.

Eudorea muneralis Zetterstedt, Ins. Lapl., 971, 1840.

Phycis quadratella Zetterstedt, Ins. Lapl., 997, 1840.

Hyphen cecalis Walker, Cat. Brit. Mus., xvi, 36, 1858.

Scopula caliginosalis Walker, Cat. Brit. Mus., xxxiv, 1460, 1865.

Scoparia centuriella Grote, New ch. list Am. moths, 52, 1882.

Scoparia ninguidalis Hulst, Trans. Am. ent. soc., xiii, 147, 1886.

Scoparia centuriella Fernald, Smith's list Lep. Bor. Am., no. 4127, 1891.

Scoparia albisinuatella Fernald (not Packard), Smith's list Lep. Bor. Am., no. 4129½, 1891.

Scoparia centuriella Hampson, Trans. ent. soc. Lond., 234, 1897.

Scoparia frigidella Hampson (not Packard), Trans. ent. soc. Lond., 234, 1897.

Scoparia albisinuatella Hampson (not Packard), Trans. ent. soc. Lond., 234, 1897.

Scoparia centuriella Staudinger & Rebel, Cat. Lep. Eur., ii, no. 946, 1901.

Scoparia centuriella Dyar, Proc. Wash. Acad. Sci., ii, 498, 1900.

Scoparia centuriella Fernald, Bull. 52, U. S. Nat. Mus., no. 4510, 1903.

Scoparia centuriella Dyar, Proc. U. S. Nat. Mus., xxvii, 918, 1904.

♂. Light ashen gray to dark blackish gray, usually pale; lines dark, diffused, the outer excurved over cell, the inner dark, often indented on the costa, the outer pale edged; a black linear claviform; narrowly elliptical or linear orbicular, quadrate suffused, reniform, hour-glass shaped or of two opposed cusps; a dark shade subapically and above tornus. Hind wing sordid, dark along the margin. Expanse, 29-32 mm.

♀. Darker, the marks obscured or nearly entirely obsolete, the lines and reniform longest persistent. Expanse, 29-33 mm.

Northern Europe to the Arctic regions; Nova Scotia (Walker); Arizona (Hulst).

3 ♂, 1 ♀, Orono, Maine, Amherst, Mass (C. H. Fernald); 1 ♀, Arizona, labelled "*Scoparia ninguidalis* Hulst, type" (Coll. Prof. C. H. Fernald); 3, Montana (through C. V. Riley); 12, Popof Is., Alaska, July, 1899 (Harriman expedition); 26, Kaslo, B. C., June, July, August (H. G. Dyar); 1, New York (C. V. Riley); 1, Plattsburgh, N. Y., June 21, 1888 (H. G. Dyar); 6, Southern Utah, July, 1900 (O. C. Poling); 1, Glenwood Springs, Col., July (W. Barnes); 1, Pikes Peak, Col., above timber, July 21, 1901 (Dyar & Caudell).

The Western form is larger and somewhat more contrasted in color and may be distinguished as variety *ninguidalis* Hulst.

Scoparia normalis Dyar.

Scoparia normalis Dyar, Ent. news, xv, 71, 1904.

Pale gray; a black shade at base of fore wings; inner line dark, slightly bent at middle, thickened on costal two thirds by a broad black bar which absorbs orbicular and claviform; reniform fused to costa by a black shade, formed of two superposed confluent ellipses, partly filled with black; outer line pale, narrowly black shaded within, bent outward slightly beyond reniform; terminal space irregularly black shaded, the shades succeeding the outer line on costa and inner margin and on center of outer margin; a row of black terminal points; fringe dark gray with white dashes at the ends of the veins. Hind wings soiled whitish, darkest along outer margin. Expanse, 26 mm.

One ♀, Beulah, New Mexico, 8,000 feet (T. D. A. Cockerell). It resembles the ♂ of *centuriella* Schiff., but is very different from the ♀ of that species.

Type no. 7654, U. S. Nat. Mus.

Scoparia delphusa Druce.

Scoparia delphusa Druce, Biol. Cent.-Am., Lep. Het., ii, 279, pl. lxiv, f. 1, 1895.

Scoparia delphusa Hampson, Trans. ent. soc. Lond., 234, 1897.

Scoparia delphusa Fernald, Bull. 52, U. S. Nat. Mus., no. 4509, 1903.

"Primaries pale greyish-brown, crossed by two waved white lines edged with black on the inner side—the first near the base, the second submarginal—a dark brown spot partly crossing the wing from the costal margin towards the base, the fringe grey and brown; secondaries semihyaline greyish-white, slightly shaded with brown near the apex, the fringe greyish-white; head, antennæ, palpi and thorax pale brown, the abdomen grey. Expanse 1 inch." (Druce.)

Amecameca in Morelos, Mexico City, Mex.; Quiche Mts., Totomcapam, Guatemala (Druce). Sir George Hampson adds "Western States," but I do not otherwise know the species from our territory, nor have I seen a specimen.

***Scoparia penumbralis*, new species.**

Smoky brownish gray; lines whitish, the inner wavy, the outer slightly excurved opposite the cell, both edged toward middle by dark narrow shades; traces of reniform discal dot apparently in two cusps, but much obscured; terminal space slightly paler; subterminal line lost. A dusky colored and very uniform species. Expanse 12 mm.

4 from Prof. Fernald labelled 318 and 7, 25 and Ent. Soc. Ont., 146 and 17, Dr. Dietz, Hazleton, Pa., June 8, 1895; 2, Montclair, N. J., June 13, 1899 (W. D. Kearfott); 1, Essex Co. Park, N. J., June 3, 1899 (W. D. Kearfott); 3, Center Harbor, N. H., June 22, 1902 (H. G. Dyar); New Brighton, Pa., June 17, 1902 (H. D. Merrick).

Type no. 9634, U. S. Nat. Mus.

***Scoparia cinereomedia* Dyar.**

Scoparia cinereomedia Dyar, Ent. news, xv, 72, 1904.

Pale gray; basal space heavily, but not continuously shaded in black as far as the inner line; center of wing clear gray, the outwardly placed reniform composed of two superposed ellipses, clouded and fused to costa by black; outer line narrow, pale, crenulate, bent opposite reniform but not forming an arc, black edged within. Terminal space shaded in black, leaving a pale space below apex and above anal angle; terminal black spots diffuse; fringe white with a dark basal line. Hind wings grayish, subpellucid. Expanse 14.5 mm.

Two specimens, New Brighton, Pa. (H. D. Merrick.)

Type no. 7657, U. S. Nat. Mus.

***Scoparia schwarzalis*, new species.**

Fore wing light gray, the extreme base dark; a broad dark shade beyond the pale sinuate inner line, enclosing the quadrate black reniform and oblique linear orbicular; a broad space of the pale ground to outer line. Reniform of two opposed black cusps; outer line dark, narrowly excurved at end of cell, dentate, closely fol-

lowed by a broad dark shade; submarginal light space excised at middle by a black mark resting on margin. Hind wings pale gray. Expanse 16 mm.

One ♂, Santa Rita Mts., Ariz., May 30, 1898 (E. A. Schwarz).
Type no. 9636, U. S. Nat. Mus.

***Scoparia strigalis*, new species.**

Light gray, lines very obscure, darker; outer line irregularly excurved over cell; a black basal dash to first line; a long black dash for claviform; a short black dash for orbicular and a longer one for reniform; two slender dashes in terminal area opposite the reniform dash; a small dark apical shade. Hind wings silky gray. Expanse 13-17 mm.

Grimsby, Ontario (J. Pettit); Delaware Co., Pa., August 17 (P. Laurent); Plummer's Is., Md., July 1, 1903 (A. Busck).

Type no. 9635, U. S. Nat. Mus.

***Scoparia lugubralis* Walker.**

Scoparia lugubralis Walker, Cat. Brit. Mus., xxxiv, 1498, 1865.

Scoparia nominatalis Hulst, Trans. Am. ent. soc., xiii, 148, 1886.

Scoparia nominatalis Hampson, Trans. ent. soc. Lond., 233, 1897.

Scoparia lugubralis Hampson, Trans. ent. soc. Lond., 233, 1897.

Scoparia lugubralis Fernald, Bull. 52, U. S. Nat. Mus., no. 4504, 1903.

Scoparia nominatalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4505, 1903.

Scoparia nominatella Dyar, Proc. U. S. Nat. Mus., xxvii, 918, 1904.

Ashen gray to bluish gray, lines whitish; inner line arcuate, edged without with black, often strongly so, even forming a broad black band on costal half; claviform faint, clouded or absent; orbicular a dash, from which a line extends to reniform, or two lines, enclosing an elliptical pale space that looks like an orbicular; reniform of two opposed cusps; outer line pale, rather narrowly excurved over cell, followed by a dark shade, divided centrally; submarginal line obsolete. Hind wings subpellucid pale grayish. Expanse 17-21 mm.

St. Martin's Falls, Hudson Bay (Walker); Vancouver Is., B. C. (Hulst).

Los Angeles, Cal. (D. W. Coquillett); Arizona (Morrison); Seattle, Wash., June 7, 1902 (T. Kincaid); Glenwood Springs, Col., July 24-30 (Dr. Barnes); Pullman, Wash., July 26, 1898 (C. V. Piper); 6, Kaslo, B. C., August (J. W. Cockle, H. G. Dyar); Denver, Col. (E. J. Oslar); Platte Canyon, Col., August 26, 1904 (E. J. Oslar); Wellington, B. C. (G. W. Taylor); White Mts., N. H. (coll. Prof. C. H. Fernald).

A figure of Walker's type has been made for me by Mr. Horace Knight through the kindness of Sir G. F. Hampson. It has a faded yellowish look, but otherwise is a specimen of *nominatalis* with little

development of the dark shades. The ordinary spots are joined by a slender line on subcostal and median veins.

Scoparia tricoloralis Dyar.

Scoparia tricoloralis Dyar, Ent. news, xv, 72, 1904.

Scoparia tricoloralis Dyar, Proc. U. S. Nat. Mus., xxvii, 818, 1904.

Light gray, shaded with black; a black patch at base of fore wing on costa; inner line pale, slightly oblique, bent a little at the middle, followed on costal two-thirds by a heavy black band that absorbs the orbicular and claviform; reniform small, of two superposed black spots, followed by a large, contrasted, brown cloud; outer line narrow, white, narrowly dark-edged within, roundedly, evenly and strongly bent outward beyond the reniform; terminal space heavily black shaded, cut outwardly centrally by a diffuse pale arc, representing the subterminal line. Fringe pale, black checkered at base. Hind wings blackish shaded, subpellucid along internal margin. Expanse, 19-21 mm.

4, Wellington, B. C. (Theo. Bryant); Kaslo, B. C. (Caudell, Currie and Cockle); 4, Seattle, Wash. (O. B. Johnson); 1, Arrowhead Lake, B. C. (Dr. Barnes).

Type no. 7656, U. S. Nat. Mus.

Ab. a. The ground color is less darkened, the whitish shades to the outer line scarcely relieved; red-brown shade absent except a little in reniform.

Denver, Col., July 29, 1904 (E. J. Oslar).

Ab. b. Median space solidly filled in dark, black basally, red-brown outwardly.

Denver, Col., August 6, 1904 (E. J. Oslar).

Scoparia basalis Walker.

Scoparia basalis Walker, Cat. Brit. Mus., xxxiv, 1497, 1865.

Scoparia biplagalis Walker, Cat. Brit. Mus., xxxiv, 1499, 1865.

Scoparia libella Grote, Bull. U. S. Geol. Surv., iv, 675, 1878.

Scoparia libella Grote, New ch. list No. Am. moths, 52, 1882.

Scoparia libella Fernald, Smith's list Lep. bor. Am., no. 4128, 1891.

Scoparia biplagalis Hampson, Trans. ent. soc. Lond., 234, 1897.

Scoparia basalis Hampson, Trans. ent. soc. Lond., 234, 1897.

Scoparia basalis Fernald, Bull. 52, U. S. Nat. Mus., no. 4507, 1903.

Scoparia fernaldalis Dyar, Ent. news, xv, 72, 1904.

Scoparia fernaldalis Dyar, Proc. U. S. Nat. Mus., xxvii, 818, 1904.

Light gray; inner line pale, gently arcuate, edged without with blackish, to which the claviform and orbicular are attached, the whole forming an apparent dark band on upper half, vacuolated in pale yellowish; reniform distant, hour-glass-shaped, filled with pale yellowish, or broken into two cusps, the yellowish often evanescent; outer line pale, gently and rather narrowly excurved over cell; terminal space dark filled, faintly cut by the pale, diffuse subterminal line, tending to become a dark triangle on center of margin. Hind wing pale grayish. Expanse, 11-16 mm.

"North America" (Walker); St. Martin's Falls, Hudson Bay (Walker); Maine, Massachusetts, New York (Grote).

One from Prof. C. H. Fernald labelled "*Scoparia libella* Grote, homotype"; Plummer's Is., Md., September, 1903 (A. Busck); New Brighton, Pa., June 9, 22, 1900 (H. D. Merrick); King and Bartlett Lk., Maine (P. Laurent); North Carolina (Morrison); Center Harbor, N. H., June 20, 1902 (H. G. Dyar); Ontario, Canada (Dr. Fletcher); Virginia, September 16, 1880 (T. Pergande); D. C., September 27, 1885 (U. S. Dept. Agriculture); Iowa (C. P. Gillette); New York (Riley coll.); Rhinebeck, N. Y., September 4, 1887, July 1888 (H. G. Dyar); North Mt., Pa. (P. Laurent); St. Louis, Mo., August 20, 1904 (H. McElhose); Archer, Fla., December 3, 1882 (A. Koebele); Pittsburgh, Pa., June 11, 1905 (H. Engel).

Ab. a. palloralis, new variety. Generally larger, paler, though not contrastingly so; the markings brown rather than black.

Arizona (Morrison); Argus Mts., Ariz., May, 1891 (A. Koebele); Wilgus, Cochise Co., Ariz. (Dr. Barnes); Beulah, New Mexico, 8,000 ft., August (T. D. A. Cockerell); Dripping Spring, N. Mex. (T. D. A. Cockerell); Platte Canyon, Colorado (E. J. Oslar); Pinal Mts., Ariz., July, 1900 (R. E. Kunzé in coll. W. D. Kearfott).

Type no. 9637, U. S. Nat. Mus.

Ab. b. fernaldalis Dyar. Rather larger, distinctly darker, the ground color blackish gray, on which the markings are not strongly relieved.

194, Kaslo, B. C., June, July, August (Dyar, Currie, Caudell, Cockle); Shannigan Lk., B. C., August 30 (H. G. Dyar); Wellington, B. C. (T. Bryant).

Type no. 7655, U. S. Nat. Mus.

Ab. c. obispalis, new variety. Small, uniformly gray, the spots blackish, diffused shades without sharp marks, the outer line nearly absent.

4, San Louis Obispo, Cal., March (A. H. Vatchell, from W. D. Kearfott).

Type no. 9638, U. S. Nat. Mus.

Scoparia torniplagalis Dyar.

Scoparia torniplagalis Dyar, Journ. N. Y. ent. soc., xii, 105, 1904.

Wings narrow; light gray, basal space slightly ochreous tinted, a black subbasal point, incompletely connected to base; inner line strongly oblique, whitish, slightly

notched on median vein, black shaded without; a diffuse brown shade spreads from the black color to the disk. Reniform marked by a fine, irregular black X-mark. Outer line narrowly excurved over cell, else nearly straight, whitish, narrowly black edged within. A black shade at tornus and small dot opposite center of outer margin. Hind wing pale whitish, smoky on margin. Expanse, 17 mm.

2, Seattle, Washington (O. B. Johnson); Rico, Colorado (E. J. Oslar from W. D. Kearfott).

Type no. 7886, U. S. Nat. Mus.

Scoparia atropicta Hampson.

Scoparia atropicta Hampson, Trans. ent. soc. Lond., 233, 1897.

Scoparia atropicta Fernald, Bull. 52, U. S. Nat. Mus., no. 4506, 1903.

Sir George Hampson has kindly sent me a figure of this species, which shows a form unlike anything known heretofore from North America. He says the label is "Am. Sept. 5, iv, Mus. Z. Mschl 5, 79." but adds that the locality is probably a mistake and the species is the same as *S. exhibitalis* Walker from Australia. I believe this to be correct and, with this explanation, drop the name from the American list.

**DESCRIPTIONS OF FOUR NEW SPECIES OF
NORTH AMERICAN MOTHS.**

BY HARRISON G. DYAR, PH.D.,

WASHINGTON, D. C.

Family PYRALIDÆ.

Genus **SALEBRIA** Zeller.

***Salebria engeli*, new species.**

Belongs to the group *pumilella* Rag., *annulosella* Rag., *nubiferella* Rag., *turpidella* Rag., *tenebrosella* Hulst, and resembles these forms, except that the whole wing is darkly obscured with black, on the basal half so much so as to hide the lines, while the white mark on the inner margin is large, pure white and contrasted.

One ♂, Oak Station, Pa., July 10, 1904 (sent by Mr. H. Engel).

Type no. 9787, U. S. National Museum.

Genus *IMMYRLA*, new.

Fore wings with 11 veins, hind wing with 8 veins; ♂ antennæ with a large tuft at base; palpi large, upturned, hollowed to receive the pencil-tufted maxillary palpi; fore wing with subbasal scale ridge.

Differs from *Salebria* in the presence of the scale ridge.

***Immyrta nigrovittella*, new species.**

Uniform dark gray, the median space a shade lighter; scale ridge narrow, deep black, slightly oblique and not quite attaining costa; inner line just beyond, faint, parallel to scale ridge, scarcely waved; discal dots confluent in a bar, dark gray; outer dark shading crosses the outer line, which is pale, faintly dark-edged, gently bowed in the middle. Expanse, 20 mm.

One ♂, Pittsburgh, Pa., May 29, 1905 (Henry Engel).

Type no. 9786, U. S. National Museum.

Genus *EURYTHMIA* Ragonot.***Eurythmia yavapaëlla*, new species.**

Dark gray, the abdomen ocherous, tinted at tip. Fore wing gray, a little darker along costa and in outer field; lines pale, rather broad, weakly defined by dark scales, slightly flexuous; discal dots black, separate, distinct in one specimen, partly absent in the other. Hind wing subpellucid whitish, gray shaded on costa and apex. Expanse, 16 mm.

Two ♂, Yavapai Co., Arizona (through Mr. W. D. Kearfott). Apparently near *coloradella* Hulst, but larger and more distinctly marked.

Type no. 9858, U. S. National Museum.

Family TORTRICIDÆ.**Genus *EUCOSMA* Hübner.*****Eucosma picicolana*, new species.**

Head and front of collar rusty ocherous; thorax and abdomen light gray. Fore wing light gray, mottled-strigose in darker; base and anterior line, broken mesial line, outer band from costa toward tornus darker gray, angularly edged, indistinct; a neat round patch before tornus on inner margin of brownish black, nearly solid; a similarly colored band from apex, curving again to outer margin below middle, these marks distinct. Fringe dark, as also extreme margin, white at angle. Hind wing dark gray, indistinctly darker strigose; fringe white. Below, fore wings dark gray with costa whitish; hind wings whitish, with sparse strigose blotches, thicker at margin. Expanse, 33 mm.

One ♀, bred from a mass of pitch on the trunk of *Abies lasiocarpa* at Paradise Valley, Mt. Rainier, Washington, by Mr. H. E. Burke, of the Bureau of Entomology, Department of Agriculture.

Type no. 9801, U. S. National Museum.

In the absence of a ♂, the species may not be correctly referred generically.

JOURNAL

OF THE

New York Entomological Society.

EDITED BY HARRISON G. DYAR.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

BOOK NOTICES.

Twentieth Report of the State Entomologist on injurious and other insects of the State of New York, 1904, New York State Museum, Bulletin 97, Entomology 24. By EPHRAIM PORTER FELT, State Entomologist, Albany, New York, State Education Department, 1905.

Dr. Felt's report covers 206 pages with 19 plates and an index. A general account occupies 84 pages; then 58 pages are devoted to studies in Culicidæ, followed by an account of the Jassidæ of New York State by Herbert Osborn, a list of the Hemiptera taken in the Adirondack Mts. by E. P. VanDuzee and of the Lepidoptera taken at Keene Valley by G. F. Comstock. The plates all refer to the article on Culicidæ. The wing scales are given of several exotic species and figures from photographs of the genitalia of 32 species, most of which are here figured for the first time. Only a few of the species are native to New York and are mainly widely exotic. We find the figures most valuable and interesting, but cannot help feeling that the place of publication is a mistake. One of the regular entomological journals would have been more appropriate.

Dr. Felt describes a new species, *Culiselsa auroides* (p. 449) both adult and larva, which he finds allied to *aurifer* Coq. He has kindly loaned us his slides of this larva, which appears to us rather allied to *trivittatus* Coq., as it falls next thereto in our tables. He proposes

the name *subcantans** (p. 474) for the American species heretofore known as *cantans* Meig. The genitalia of our form are found to differ from those of the European species, specimens of which Dr. Felt has received from Dr. F. Meinert. This agrees with what we had anticipated (Journ. N. Y. ent. soc., xiii, 51, 1905) and we congratulate Dr. Felt on being able to demonstrate it. We notice some discrepancies between the figures of the genitalia of *fitchii* and *abfitchii* and our own figures of these species, recently published in this Journal. These concern the filament of the harpe, a very delicate structure, the shape of which may be apparently altered by differences in the excellence of the preparation. We think our figure of *fitchii* is the better, while Dr. Felt has evidently secured a better illustration of *abfitchii* than we did.

Notes on Some Jamaican Culicidæ. By M. GRABHAM, M.A., M.B., Government Medical Service, Jamaica, West Indies. Canadian Entomologist, xxxvii, 401-411, 1905.

We desire to notice Dr. Grabham's paper, principally because he has illustrated the very parts of the mosquito larvæ which we want to know about, and we are able to place nearly all the species he describes at once in our tables. But the larvæ do not agree with those that we have had (and in some cases described) under these names. We believe that in no case is there an agreement. Dr. Grabham describes *Uranotenia lowii* Theob., and *U. socialis* Theob., but we can not make either agree with Miss Mitchell's detailed separation of these forms as they occur in New Orleans. *Melanoconion atratus* Theob. does not agree; our larva has a pilose body and shorter air tube. *Culex confirmatus* Arrib. is widely different from the continental form; our larva is glabrous and the pecten of the air tube runs only half way. *Culex janitor* Theob., is still more different; we have a larva with a long air tube and antennal tuft at the outer fourth arising from a set-off as in *secutor*. *Culex microsquamatus* Theob. is a new species and the larva new to us. There can be no argument about this one. *Janthinosoma jonstonii* Grabham is described without larva. Now all this discrepancy means either that the larvæ are variable, in which case we can not separate one Culicid larva from another, or that somebody's determinations are faulty. Dr. Grabham's adults were, we presume,

* But the *stimulans* of Walker, heretofore referred to the synonymy of *cantans*, has yet to be accounted for.

determined by Mr. Theobald; ours were named by Mr. Coquillett. We invite these gentlemen to get together and compare notes.

Report and Yearbook of the Experiment Station Committee of the Hawaiian Sugar Planters' Association for the year ending September 30, 1905. Honolulu, 1905.

This report appears to be from a committee of the experiment station in the planters' association, though no author is mentioned. A list of all the officers is given on the first page. There are a number of separately paged papers, of which only the entomological ones interest us here. These are Bulletin no. 1 — Leaf-hoppers and Their Natural Enemies, divided into parts:

Part I — Dryinidæ, by R. C. L. Perkins.

Part II — Epipyropidæ, by R. C. L. Perkins.

Part III — Stylopidæ, by R. C. L. Perkins.

Part IV — Pipunculidæ, by R. C. L. Perkins.

Part V — Forficulidæ, Syrphidæ and Hemerobiidæ, by F. W. Terry.

Part VI — Mymaridæ, Platygasteridæ; by R. C. L. Perkins.

Also two circulars by Perkins on the history and occurrence of the sugar cane leaf-hopper (*Perkinsiella saccharicida* Kirkaldy) and some diseases of cane especially considered in relation to the leaf-hopper pest and to the stripping of cane.

The part on Lepidoptera treats of the family Epipyropidæ, which Mr. Perkins proposes as new, but which we had already used (Bull. 52, U. S. Nat. Mus., 359, 1903). Three new genera and seven species are described (from Australia), and many new and highly interesting facts about the life histories and habits are recorded. Perhaps the most peculiar are that some of the species are parthenogenetic, while the newly hatched larva has a special structure and actively seeks its prey, the eggs being laid on plants. The larvæ seem to be true parasites, causing the death of the host. Mr. Perkins gives a synoptic table of the genera, but does not include the genus *Epipyrops* of Westwood, which we would do as follows. We would add a new genus, *Epipomponia*, proposed for our species *nawai* (Proc. ent. soc. Wash., vi, 19, 1904) described from Japan. In the bibliography Mr. Perkins could have added two notes published in the Proc. ent. soc. Wash., v, 180, 1903, and vi, 19, 1904.

Table of genera of Epipyropidæ.

1. Hind wings with eight veins; 7 and 8 of fore wings separate.....2.
Hind wings with less than eight veins; 7 and 8 of fore wings approximated or united3.
2. Hind wings with vein 8 free.....**Epipyrops** Westwood.
Hind wings with vein 8 joined to the subcostal by a bar**Epipomponia** Dyar.
3. Vein 7 of hind wings apparently free to base; fore wings with 12 veins.
Palæopsyche Perkins.
Hind wings with normal venation; fore wings with less than 12 veins4.
4. Fore wings with veins 7 and 8 long-stalked or coincident...**Agamopsyche** Perkins.
Fore wings with veins 7 and 8 connate.....**Heteropsyche** Perkins.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF MAY 16, 1905.

Held at the American Museum of Natural History.

President C. H. Roberts presided with eleven members in attendance.

The librarian reported the receipt of the following exchanges:

Verh. d. k. k. Zool. Bot. Gesell. Wien., Vols. LIV, No. 10; LV, Nos. 1 and 2.

Proc. Am. Acad. Arts and Sci., Vol. XL, Nos. 12, 13 and 14.

Proc. Am. Philos. Soc., Vol. XLIII, No. 178.

Tijdsch. v. Entom., 1904, Nos. 2, 3 and 4.

Sci. Bull., Vol. I, Nos. 5 and 6 of Mus. Brooklyn Institute.

Cold Springs Harbor Laboratory Monographs, III, 1905.

Zeitsch. f. Wissenschaft. Insekten biol., Bd. I, Nos. 3 and 4.

Jahresbericht des Wien. Ent. Vereins., 1904.

Canad. Entom., XXXVII, Nos. 4 and 5.

Wien. Ent. Zeit., XXIV, Nos. 3 and 4.

Deutsche Entom. Zeitschrift, 1905, No. 1.

Descript. du Matériel d. petite installation scientifique, 1 part, 1903, by Chas. Janet.

Observations sur les Gûpes, by Chas. Janet.

Observations sur les Fourmis, by Chas. Janet.

Report on Mosquitoes, by John B. Smith, 1904.

Hayden's Geological Survey, Report for 1871 and 1872.

Proc. U. S. Nat. Museum, XXVIII, No. 1398.

On motion of Mr. Joutel the Society voted to set aside the sum of \$25.00 which the publication committee and librarian were authorized to draw upon for the purchase of books for the library.

(To be continued.)

JOURNAL

OF THE

New York Entomological Society.

Vol. XIV.

SEPTEMBER, 1906.

No. 3

Class I, HEXAPODA.

Order II, COLEOPTERA.

THE NORTH AMERICAN SPECIES OF THE GENUS NOTARIS GERM.

BY F. H. CHITTENDEN, SC.D.,

WASHINGTON, D. C.

Notaris, Magazin der Entomologie, vol. II, p. 340, 1817.

In 1876, in The Rhynchophora of America North of Mexico (p. 163), LeConte placed two *Eriirhinines*, *morio* Mann. and *puncticollis* Lec., in the genus *Erycus* Tourn.,* and they are thus classified in our catalogues and collections, notwithstanding the fact that European systematists have relegated *Erycus* to a subgenus under *Notaris* Germar, which latter was proposed in 1817.

The genus *Notaris* was defined by Stephens in 1831,† and more recently characterized by Faust.‡ Briefly, it contains those species of *Eriirhinini* in which the prosternum is deeply emarginate on the anterior margin, the femora are moderately clavate and simple, and the postocular lobes are distinct and wide, the posterior tibiae being feebly mucronate. The apical sutures of the second, third and fourth abdominal segments are very prominent. In the male the first and second are shallowly but widely concave and the apex of the fifth feebly. LeConte's characterization of *Erycus*, with two very small spines or spurs on the posterior tibiae, does not hold for a species which will presently be described.

* Ann. Soc. Ent. de Belgique, vol. XVII, p. 92, 1874.

† Ills. Brit. Ent., Mandibulata, vol. IV, p. 81, 1831.

‡ Bull. Soc. Impériale Naturalistes Moscou, 1882, pp. 136-143.

SYNOPSIS OF SPECIES.

Subglabrous, shining, thorax sparsely punctate; elytral striae moderately shallow, with small, closely-set punctures, N. W. *æthiops* Fab.

Distinctly minutely pubescent; thorax densely coarsely punctate.

Rostrum coarsely punctate, subopaque; antennæ inserted in apical fourth, club as long as preceding four joints, last funicular joint transverse; elytral striae coarsely deeply punctate, E. U. S. *puncticollis* Lec.

Rostrum finely, more sparsely punctate, shining; antennæ inserted near middle, club shorter than preceding four joints, last funicular joint as long as wide; elytral striae fine, Wyo., Col. *wyomingensis* n. sp.

Notaris æthiops Fabricius.

Curculio æthiops Fabricius, Entomologia Systematica, vol. I, pt. 2, p. 405, 1792.

Eirrhinus morio Mannerheim, Bul. Soc. Mosc., 1853, II, 240.

Erycus morio LeConte, Proc. Am. Phil. Soc., 1876, p. 163.

Eirrhinus æthiops Faust, Bul. Soc. Mosc., 1882, pp. 164-167.*

Easily distinguished from our other species by the characters of the table.

Length. — 6.0 mm.; width, 2.5 mm.

Habitat. — Sweden, Germany, boreal Europe and Siberia; Kadjak, Kenai, Wrangel, Alaska; Vancouver, Manitoba, Great Slave Lake, Canada (Hamilton).† In the National collection there are specimens from the following localities: Como, S. Wyo., alt. 8,000 ft.; Whitefish, L. S., Bear Paw Mt., Mon., and Leadville, Colo. (Hubbard & Schwarz). Evidently a truly circumpolar form.

Notaris puncticollis Lec.

Erycus puncticollis LeConte, Rhynch. N. A., Proc. Am. Phil. Soc., vol. XV, p. 163, 1876.

In describing the pubescence of the elytra LeConte mentions "a more conspicuous sutural transverse spot behind the middle." In many specimens this feature is not at all conspicuous, partly owing to easy abrasion. Where present these spots extend across the second and third interval. The fifth abdominal segment is much more finely and densely punctate than the others, and is less reflexed at apex.

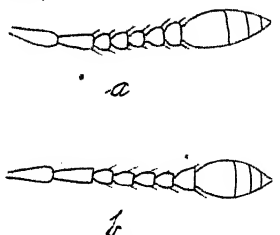
Length. — 4.8-6.5 mm.; width, 2.3-3.0 mm.

Habitat. — "Middle and Western States and Lake Superior" (LeConte); New York and vicinity, April 17-26; October 21 (Juelich & Roberts); Buffalo, N. Y., June 15; Ithaca, N. Y., April 25; Chicago, Ill. (Chittenden); Whitefish Point, L. S.; Minnesota; Wisconsin; Detroit, Port Huron and Backwing, Mich.; Whitefish,

* The European literature is quite extensive and is not quoted at length.

† Tr. Am. Ent. Soc., 1894, p. 34.

L. S. (Hubbard & Schwarz); Wayne County, Ohio (Webster); Columbus, Ohio (Sanders).



Antennal characters of (a) *Notaris puncticollis*; (b) *N. wyomingensis*.

Notaris wyomingensis, new species.

Form similar to *puncticollis* Lec., but proportionately more slender; black, antennæ, tarsi and tibiæ rufo-piceous. Rostrum somewhat finely and sparsely punctate, not carinate, surface shining. Antennæ of ♀ inserted near middle of rostrum, of ♂ two-fifths from apex. Last funicular joint subtriangular, considerably larger than the preceding, as long as wide; club wide, not as long as preceding four joints. Thorax a little wider than long; sides rather strongly arcuate; surface coarsely densely, subrugosely punctate, sparsely covered with scale-like yellowish setæ, directed transversely, forming a dorsolateral fascia each side and leaving a median smooth line extending from apex about four-fifths to base. Elytra (♀) one-third or less wider than thorax; humeri rounded; striae shallow, intervals densely punctate, sparsely pubescent, consisting of very short scale-like setæ, third interval flat or feebly elevated, bearing a small tuft of prostrate whitish hairs behind the middle. Lower surface moderately coarsely, densely and nearly uniformly punctate, the punctures growing a little finer but not denser apically. The apex of the fifth abdominal segment somewhat strongly reflexed. Posterior tibiæ without short terminal spurs.

Length. — 6.5–7.5 mm.; width: 2.2–2.8 mm.

Habitat. — Cheyenne and Laramie, Wyo. (H. Soltau); “Wyo.”; Colorado.

Type. — No. 9,757, U. S. National Museum.

The natural food plants of the species of *Notaris* occurring in America do not appear to have been positively ascertained, although Mr. F. M. Webster has surmised that *puncticollis* “may breed in the common *Typha latifolia* or cat-tail.” He observed this species attacking cabbage on land that had been drained (Insect Life, vol. vii, 1894, p. 206).

Allied European forms such as *Erirhinus festucae* Hbst., have been observed breeding in the stems of *Scirpus*, and the beetles have been found on Cyperaceæ, especially on *Carex*. The genus favors aquatic vegetation and the beetles are usually found in moist situations.

STRYCHNINE AS FOOD OF *ARÆOCERUS FASCICULARIS* DE GEER.

BY ROBERT E. BROWN, S.J.,

MANILA, P. I.

The weevil, *Aræocerus fascicularis*, is well known in all parts of the world on account of its cosmopolitan habits. It feeds on all kinds of seeds and nuts, but one of the strangest which it has been known to eat is the St. Ignatius' bean, *Strychninos ignatii* Berg. This plant grows wild in many parts of the Philippines, but is especially plentiful in the Island of Samar, where the fruit is called by the natives pepita-sa-catbalongan and pepita de San Ignacio. The bean is exceedingly poisonous, though it is used by the natives as a remedy for certain diseases, and it is not uncommon, as a consequence, that people die from an overdose. A quantitative analysis of the bean gave as a result $1\frac{1}{2}$ per cent. strychnine and $\frac{1}{2}$ per cent. brucine.

Strychnine is one of the deadliest poisons known, yet this little beetle not only feeds on it, but actually breeds in the cavities which it has bored in the seed. In the Observatory Museum there was a bottle containing some ten Ignatius' beans and it was noticed that a male and female *A. fascicularis* had been enclosed with them. The insects seemed to be in good health and they began gnawing the beans without any evil effects. Wishing to see if the weevil could live on such deadly poison, the bottle was sealed and set aside and in about six months, when examined, it was found that ten adult insects were enjoying themselves within. They were taken out and the beans treated with bisulphide of carbon to kill any eggs that might have been deposited in them by the weevils. Two males and two females were then replaced in the bottle with the beans and the stopper sealed. In little more than a week they all died, but in two months young larvæ could be seen in the cavities of the beans and they all grew to maturity. Since that time more than four generations of *A. fascicularis* have been bred and no other food but the Ignatius' beans was given them.

Class I, HEXAPODA.

Order V, LEPIDOPTERA.

HETEROCERA AMERICANA.

By RICHARD H. STRETCH, E.M.,

WEST SEATTLE, WASH.

A quarter of a century ago the writer had in preparation a monograph of the Bombycidae of North America, intended as an enlargement and completion of his Zygaenidae and Bombycidae of North America, published in 1872. Various causes prevented the completion of the work at that time, but the plates were nearly all prepared and in part printed. So much work has been done on the group in the interim that the "Heterocera Americana" as prepared is obsolete; but I have turned the plates over to the editor of this Journal, who thinks them worthy to present to our readers. The plates illustrate the Arctiidae and their allies. I wish to express my acknowledgments to the gentlemen who assisted me with material and otherwise in former years while the work was in preparation, Messrs. Henry Edwards, B. Neumoegen, E. L. Graef, F. Tepper and others.

EXPLANATION OF PLATES.

(Heterocera Americana, Plates II-XII.)

PLATE II.

1. *Crambidia pallida* Packard.
2. *Utetheisa bella* Linnaeus.
3. *Utetheisa ornatrix* Linnaeus.
4. *Utetheisa ornatrix* Linnaeus.
5. *Utetheisa bella* var.
6. *Utetheisa speciosa* Walker.
7. *Scepsis fulvicolis* Hübner.
8. *Scepsis wrightii* Stretch.
9. *Scepsis mathevi* Grote.
10. *Scepsis edwardsii* Grote.
11. *Psychomorpha epimenis* Drury.
12. *Clemensia* ?*

* Probably *Nola minuscula* Zell.— Editor.

13. *Syntomeida ipomææ* Harris.
14. *Emydia ampla* Grote.
15. *Edwardsia brillians* Neumöegen.
16. *Ctenucha sanguinaria* Strecker.
17. *Gnophala vermiculata*, ♂, Grote & Robinson.
18. *Gnophala vermiculata*, ♀, Grote & Robinson.
19. *Gnophala discreta* Stretch.
20. *Gnophala hopfferi* Grote & Robinson.
21. *Dahana atripennis* Grote.
22. *Cosmosoma omphale* Hübner.
23. *Halesidota trigona* Grote.
24. *Pygotenucha harrisii* Grote.
25. *Didasys belæ* Grote.
26. *Eudryas unio* Grote.
27. *Triprocris smithsonianus* Clemens.
28. *Triprocris fusca* H. Edwards.
29. *Harrisina coracina* Clemens.

PLATE III.

1. *Cisthene tenuifascia* Harvey.
2. *Cisthene plumbea* Stretch.
3. *Cisthene unifascia* Grote & Robinson.
4. *Cisthene unifascia* Grote & Robinson.
5. *Byssophaga faustinula* Boisduval.
6. *Byssophaga nexa* Boisduval.
7. *Cisthene subjecta* Walker.
8. *Cisthene subjecta* Walker.
9. *Crocota ostenta* H. Edwards.
10. *Crocota quinaria* Grote.
11. *Crocota choriona* Reakirt.
12. *Crocota opella* Grote.
13. *Crocota opella* Grote.
14. *Crocota leta* Guérin.
15. *Crocota belfrageii* Stretch.
16. *Crocota nigricans*, ♀, Reakirt.
17. *Crocota nigricans*, ♂, Reakirt.
18. *Crocota ferruginosa* Walker.
19. *Crocota costata* Stretch.
20. *Crocota rubicundaria* Hübner.
21. *Crocota rubicundaria* Hübner.
22. *Crocota choriona* Reakirt.
23. *Crocota choriona* Reakirt.
24. *Crocota choriona* Reakirt.
25. *Crocota obscura* Strecker.
26. *Crocota obscura* Strecker.
27. *Crocota* ? *

* An aberration of *aurantica* Hübn., probably not deserving a separate name. — Editor.

28. *Crocota bimaculata* Saunders?
29. *Hypoprepia fucosa* Hübner.*
30. *Hypoprepia fucosa* Hübner.†
31. *Hypoprepia fucosa* Hübner.‡
32. *Cisthene* ? *lactea* Stretch.
33. *Euphanessa mendica* Walker.
34. *Lithosia bicolor* Grote.
35. *Lithosia cephalica* Grote & Robinson.
36. *Lithosia candida* H. Edwards.
37. *Lithosia casta* Sanborn.
38. *Harrisina* (*Pygotenucha*) *funerea* Grote.
39. *Ameria unicolor* Robinson.
40. *Harrisina americana* Guérin.
41. *Harrisina metallica* Stretch.
42. *Harrisina australis* Stretch.
43. *Clemensia irrorata* H. Edwards.
44. *Clemensia irrorata* H. Edwards.
45. *Clemensia umbrata* Packard.
46. *Pyromorpha dimidiata* Herrich-Schæffer?
47. *Triprocris marteni* French.
48. *Acolithus faisarius* Clemens.
49. *Lycomorpha palmerii* Packard.
50. *Anatolmis fulgens* H. Edwards.
51. *Lycomorpha pholus* Drury.
52. *Lycomorpha miniata* Packard.
53. *Lycomorpha constans* H. Edwards.
54. *Lycomorpha constans* H. Edwards.
55. *Cydosia imitella* Stretch.
56. *Cydosia aurivitta* Grote & Robinson.

PLATE IV.

1. *Epicallia virginialis* Boisduval.
2. *Epicallia virginialis* Boisduval.
3. *Epicallia virginialis* var. *scutellata* Boisduval.
4. *Plataretia parthenos* Harris.
5. *Euprepia yarrovi* Stretch.
6. *Callimorpha lecontei* Boisduval.
7. *Callimorpha lecontei* Boisduval.
8. *Callimorpha reversa* Stretch.
9. *Callimorpha lecontei* Boisduval.
10. *Callimorpha reversa* Stretch.
11. *Callimorpha interrupto-marginata* de Bauvois.
12. *Callimorpha clymene* Brown.
13. *Leptarctia dimidiata*, ♂, Stretch.

* Normal form. — Editor.

† *H. miniata* Kirby. — Editor.

‡ *H. cadaverosa* Strk. — Editor.

14. *Leptarctia dimidiata*, ♂, Stretch.
15. *Leptarctia dimidiata*, ♂, Stretch.
16. *Leptarctia californiae* Walker (*lenz* Boisd.).
17. *Leptarctia californiae* Walker.
18. *Leptarctia californiae* Walker.
19. *Leptarctia adnata* Boisdual.
20. *Leptarctia adnata* Boisdual.
21. *Leptarctia californiae* Walker.
22. *Leptarctia californiae* Walker.
23. *Leptarctia decia* Boisdual.

PLATE V.

1. *Arctia docta*, var. *arizoniensis*, ♂, Stretch.
2. *Arctia docta*, var. *autholea*, ♂, Boisdual.
3. *Arctia docta*, var. *autholea*, ♀, Boisdual.
4. *Arctia superba*, ♂, Stretch.
5. *Arctia virguncula*, ♂, Kirby.
6. *Arctia bolanderi*, ♂, Stretch.
7. *Arctia nais* Drury, var. *decorata*, ♀, Saunders. Copy from Grote.
8. *Arctia nevadensis*, ♂, Grote. Copy from Grote.
9. *Arctia nevadensis*, ♂, Grote.
10. *Arctia nevadensis*, ♀, Grote.
11. *Arctia anna*, ♀, Grote.
12. *Arctia persephone*, ♂, Grote. Copy from Grote.
13. *Arctia virgo*, ♂, Kirby.
14. *Arctia virgo*, ♀, Kirby, var. *simplex* Stretch.
15. *Arctia saundersii*, ♂, Grote.
16. *Arctia arge*, ♂, Drury.
17. *Arctia arge*, ♀, Drury.
18. *Arctia blakei*, ♂, Grote.
19. *Arctia phalerata*, ♂, Harris.
20. *Arctia phalerata*, ♂, Harris.
21. *Arctia phalerata*, var. *incarnata*, ♂, n. var.
22. *Arctia internedia*, ♂, Stretch.
23. *Arctia intermedia*, ♂, var. *stretchii* Grote.
24. *Arctia rectilinea* French.
25. *Arctia gelida*, var. *speciosissima* Moeschler.
26. *Arctia intermedia*, var. *circa*, n. var.

PLATE VI.

1. *Arctia achaia*, ♂, var. *ornata* Packard.
2. *Arctia achaia*, ♀, var. *ornata* Packard.
3. *Arctia achaia*, ♂, var. *maculosa*, n. var.
4. *Arctia achaia*, ♀, var. *maculosa*, n. var.
5. *Arctia achaia*, ♂, Boisdual, type.
6. *Arctia achaia*, ♀, Boisdual.
7. *Arctia achaia*, ♂, var. *ochracea* Stretch.

8. *Arctia achaia*, ♂, var. *rivulosa*, n. var.
9. *Arctia achaia*, ♀, var. *rivulosa*, n. var.
10. *Arctia achaia*, ♂, var. *ochracea-rivulosa*, n. var.
11. *Arctia achaia*, ♀, var. *ochracea* Stretch.
12. *Arctia dahurica*, ♂, Boisduval.
13. *Arctia dahurica*, ♀, Boisduval.
14. *Arctia obliterata*, ♂, Stretch.
15. *Arctia achaia*, ♂, var. *ochracea*, aberration.
16. *Euprepia caja*, ♀, var. *americana* Harris.
17. *Kodiosoma tricolor* Stretch.
18. *Kodiosoma eausii* Stretch.
19. *Kodiosoma niger* Stretch.
20. *Kodiosoma fulva* Stretch.
21. *Nemeophila plantaginis*, ♂, Linn., var. *geometrica* Grote. Copy from Grote.
22. *Nemeophila plantaginis*, ♂, var. *cichorii* Grote.
23. *Nemeophila plantaginis*, ♂, var. *caespitis* Grote.
24. *Nemeophila plantaginis*, ♂, var. *alascensis*, n. var.*
25. *Nemeophila plantaginis*, ♂, var. *alascensis*, n. var.
26. *Nemeophila plantaginis*, ♂, var. *alascensis*, n. var.
27. *Nemeophila plantaginis*, ♀, var. *alascensis*, n. var.
28. *Nemeophila plantaginis*, ♀, var. *alascensis*, n. var.

PLATE VII.

1. *Arctia docta*, var. *autholea*, ♀, Boisduval.
2. *Arctia nais*, ♀, var. *decorata* Saunders.
3. *Arctia nais*, ♀, var. *decorata* Saunders.
4. *Arctia phalerata*, ♂, var. *incarnata* Stretch.
5. *Arctia phalerata*, ♂, var. *incarnata* Stretch.
6. *Arctia elongata*, ♀, Stretch.
7. *Arctia michabo*, ♂, Grote.
8. *Arctia dahurica*, ♂, Boisduval.
9. *Arctia williamsii*, ♀, Dodge. Copy from Dodge.
10. *Arctia phyllira*, ♀, Drury. Copy from Drury.
11. *Arctia nais*, ♂, Drury. Copy from Drury.
12. *Arctia placentia*, ♂, Hübner (*phyllira* Hüb.). Copy from Hübner.
13. *Arctia phalerata*, ♂, Harris (*nais* Hübner). Copy from Hübner.
14. *Arctia figurata*, ♂, Drury. Copy from Drury.
15. *Arctia quensellii*, ♀, Geyer. Copy from Geyer.
16. *Arctia figurata*, ♂, var. *celia* Saunders.
17. *Arctia figurata*, ♀, var. *celia* Saunders.
18. *Arctia phyllira*, ♂, Drury.
19. *Arctia phyllira*, ♀, Drury.
20. *Arctia placentia*, ♂, Sm.-Abbott.
21. *Arctia placentia*, ♀, Sm.-Abbott.
22. *Arctia figurata*, ♂, var. *pallida* Strecker. Copy from Strecker

* This is what we have called var. *modesta* Pack. — Editor.

23. *Arctia cervinoides*, ♂, Strecker. Copy from Strecker.
24. *Arctia persephone*, ♂, Grote.
25. *Euprepia opulenta*, ♂, Hy. Edwards.

PLATE VIII.

1. *Arctia geneura*, ♂, Strecker. Copy from Strecker.
2. *Arctia rectilinea*, ♂, var. *conspicua*, n. var.
3. *Arctia docta*, ♂, Walker.
4. *Arctia virgo*, ♂, var. *simplex* Stretch.
5. *Arctia virgo*, ♀, Linnæus.
6. *Arctia blakei*, ♂, Grote.
7. *Arctia michabo*, ♂, Grote.
8. *Arctia michabo*, ♀, Grote.
9. *Arctia michabo*, ♀, Grote.
10. *Arctia approximata*, ♀, Stretch.
11. *Arctia intermedia*, var. *stretchi* Grote.
12. *Arctia nais*, ♂, Drury.*
13. *Arctia nais*, ♀, Drury.†
15. *Arctia nais*, ♀, var. *decorata* Saunders.*
16. *Arctia phalerata*, ♀, Harris.‡
17. *Arctia phalerata*, ♀, Harris.*
18. *Arctia phalerata*, ♀, var. *pulcherrima*, n. var. §
19. *Arctia phalerata*, ♀, var. *pulcherrima* n. var.
20. *Arctia arge*, ♂, var. *strigosa* Stretch.
21. *Arctia virguncula*, ♂, Kirby.
22. *Arctia nais*, var. *decorata* (radians of Walker).
23. *Arctia figurata*, ♀, var. *snowi* Grote.
24. *Arctia placentia*, ♀, var. *flammea* Neumögen.
25. *Arctia figurata*, ♂, var. *excelsa* Neumögen.

PLATE IX.

1. *Callimorpha lecontei*, var. *contigua* Walker.
2. *Callimorpha lecontei*, var. *confinis* Walker.
3. *Callimorpha lecontei*, var. *montana* Neumögen.
4. *Arctia figurata*, ♀, Drury.
5. *Arctia determinata*, ♂, Neumögen.
6. *Arctia incorrupta*, ♂, type, H. Edwards.
7. *Arctia incorrupta*, ♂, H. Edwards.
8. *Arctia incorrupta*, ♂, var. *ochracea* Neumögen.
9. *Arctia incorrupta*, ♀, H. Edwards.

* This is *radians* Walk. — Editor.

† This appears to be a ♂ of *decorata*. No. 14 is omitted from the text. It represents a ♀ *decorata*. — Editor.

‡ We should call this the ♀ of *nais*. — Editor.

§ We have considered this to be the usual ♀ of *phalerata*. — Editor.

10. *Arctia complicata*, ♂, Walker.
11. *Arctia figurata*, ♂, var. *celia* Saunders.
12. *Arctia placentia*, ♀, Sm.-Abbott.
13. *Arctia placentia*, ♀, Sm.-Abbott. Copy from Smith and Abbott.
14. *Arctia persephone*, ♂, Grote.
15. *Arctia persephone*, ♂, Grote.
16. *Arctia figurata*, ♂, var. *f. pallida* Strecker.
17. *Leptarctia californica* Walk.
18. *Arctia gelida*, ♂, Moeschler.
19. *Callimorpha reversa* Stretch.
20. *Callimorpha reversa* Stretch.*
21. *Callimorpha reversa* Stretch.
22. *Callimorpha lecontei* Boisduval (hybrid).
23. *Callimorpha lecontei*, var. *fulvicosta* Clem.

PLATE X.

1. *Hyphantria cunea*, ♂, Drury, var. *textor* Harris.
2. *Hyphantria cunea*, ♂, Drury, var. *textor* Harris.
3. *Hyphantria cunea*, ♂, Drury, var. *punctata* Fitch.
4. *Hyphantria cunea*, ♂, Drury type.
5. *Sciartia clio*, ♀, Packard.
6. *Euchaetes egle*, ♀, Drury.
7. *Euchaetes elegans*, ♂, Stretch.
8. *Euchaetes collaris*, ♀, Fitch.
9. *Euchaetes oregonensis*, ♂, Stretch.
10. *Euchaetes oregonensis* Stretch.
11. *Leucarctia albida*, ♂, Stretch.
12. *Leucarctia acraea*, ♀, Drury.
13. *Leucarctia acraea*, ♂, Drury.
14. *Spilosoma vestalis*, ♀, Packard.
15. *Spilosoma latipennis*, ♀, Stretch.
16. *Spilosoma virginica*, ♀, Fabricius.
17. *Antarctia rufula*, ♂, Boisduval.
18. *Antarctia rufula*, ♂, Boisduval.
19. *Antarctia rufula*, ♂, Boisduval.
20. *Antarctia rufula*, ♀, Boisduval.
21. *Pyrrharctia isabella*, ♀, Sm.-Abbott.
22. *Pyrrharctia isabella*, ♂, Sm.-Abbott, var. *californica*, larva uniform dark gray.
23. *Pyrrharctia isabella*, ♂, Sm.-Abbott.
24. *Phragmatobia fuliginosa*, ♂, Harris.
25. *Phragmatobia fuliginosa*, ♀, Harris.

PLATE XI.

1. *Halisidota argentata*, ♀, Packard.
2. *Halisidota sobrina*, ♂, Stretch.

* This is *C. confusa* Lyman. — Editor.

3. *Halisidota tessallata*, ♂, Sm.-Abbot.
4. *Halisidota maculata*, ♀, Harris.
5. *Halisidota maculata*, ♂, Harris.
6. *Halisidota ingens*, ♀, H. Edwards.
7. *Halisidota edwardsii*, ♀, Packard.
8. *Halisidota edwardsii*, ♀, var. *labecula* Grote.
9. *Halisidota umbigua*, ♂, Strecker. Copy of Strecker.
10. *Halisidota caryæ*, ♂, Harris.
11. *Halisidota roseata*, ♂, Walker.*
12. *Halisidota roseata*, ♂, Walker.†
13. *Arachnis picta*, ♂, Packard.
14. *Seiarttia echo*, ♀, Sm.-Abbot. Copy of Sm.-Abbot.
15. *Ecpantheria scribonia*, ♂, Stoll.
16. *Ecpantheria scribonia*, ♂, Stoll.
17. *Ecpantheria scribonia*, ♂, Stoll.

PLATE XII.

1. *Nemeophila chichorii* Grote & Robinson.
2. *Nemeophila petrosa* Walker.
3. *Nemeophila geometrica* Grote.
4. *Arctia pallida*, ♀, Packard.‡
5. *Arctia pallida*, ♂, Packard.‡
6. *Phragmatobia rubricosa*, ♂, Harris.
7. *Phragmatobia rubricosa*, ♀, Harris.
8. *Phragmatobia assimilans* Walker. Walker's type.
9. *Antarctia proba* H. Edwards.
10. *Antarctia rubra*, ♂, Neumoegen.
11. *Antarctia rubra*, ♀, Neumoegen.
12. *Phragmatobius dubia* Neumoegen.
13. *Euchætes vivida* Grote.
14. *Euchætes eglenensis* Clemens.
15. *Euchætes nivalis*, new species.§
16. *Euchætes collaris* Fitch.
17. *Euchætes pudens* H. Edwards.
18. *Arachnis semiclara*, new species.||
19. *Euchætes perlevis* Grote.
20. *Euchætes sonalis* Grote.
21. *Euchætes spraguei* Grote.
22. *Leucartia? permaculata* Packard.

* This is *Euerythra trimaculata* Smith. — Editor.

† This is *E. phasma* Harvey. — Editor.

‡ Considered to be aberrations of *Hyphantria cunea*. — Editor.

§ White form of *eglenensis*. — Editor.

|| Nearest to *A. albescens* Hampson from Guatemala and possibly the ♀ of it; or it may be an *Ecpantheria* near *suffusa* Schaus. The spurs of hind tibiæ which separate *Arachnis* and *Ecpantheria* are not shown. — Editor.

23. *Euhalesidota pura* Neumcegen.
 24. *Halesidota ambigua* Strecker.
 25. *Halesidota mixta* Neumcegen.
 26. *Halesidota significans* H. Edwards.
 27. *Phryganidia californica* Packard.
 28. *Alypia maccullochii* Kirby.
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ON THE SPECIFIC VALIDITY OF *THANAOS AUSONIUS* LINTNER.

BY JOHN H. COOK,

ALBANY, N. Y.

PLATE III.

During the last four years I have been searching for *Thanaos ausonius* (Lintn.) on the pine barrens west of Albany, N. Y. The individual which Lintner described under that name was taken in this locality, and it seemed reasonable to expect it here if anywhere. Over five hundred butterflies belonging to this genus were taken, of which two hundred and eleven were *T. martialis*. No "*ausonius*" appeared to reward my efforts.

At Dr. Dyar's suggestion I made a comparative study of *martialis* and *icelus* with a view to determining, if possible, whether or not *ausonius* is entitled to specific distinction. This inquiry has been diligently prosecuted, and the results are here given.

A glance at the genitalia of *ausonius** was sufficient to prove it distinct from *icelus* and to show that if not a good species it must be regarded as a sport of *martialis*. From this species it was separated by Lintner on the grounds of its small size, and the absence of the fenestrate spots on the primaries; the other characters "distinguishing" it being of comparatively little importance.

Considering the genitalia of the greatest morphological value I first compared the tip of the right clasp of "*ausonius*" with the figure thereof given in Scudder's "Butterflies of the Eastern United States and Canada." This figure I found to be measurably accurate though somewhat diagrammatic. I next compared the tip of the left clasp of "*ausonius*" with Scudder's figure of the left clasp of *martialis*, and

* The type in the Lintner memorial collection was studied in detail by the writer.

found them somewhat different. I then made a comparative study of the clasps of twenty-five *martialis*, and found the following to be true: there is considerable variation in the detail of both clasps, the general character however remaining the same; the right clasp varies to a greater degree than the left; there is a greater difference between the corresponding clasps of individuals recognized under the common name of *martialis* than between that of "*ausonius*" and the usual *martialis*. Plate III, fig. 1, represents the tip of the right clasp of *martialis* as found in sixteen of the twenty-five examined. The view is taken from the side, a little above, and a little behind. Fig. 2 shows the same organ of *ausonius* from the same position. (These drawings magnified $14\frac{1}{2}$ times.)

It will be seen that (to quote from Scudder) "The blade of the right clasp (of '*ausonius*') differs (from that of *martialis*) in its greater slenderness, and prolongation; the denticle of the upper edge is larger, and more prickly so that the blade seems to narrow more abruptly beyond it, while the bent apex is more distinctly conical." "And pointed" is added, but I fail to agree with this. Fig. 3 shows the usual sharpness of the apex in *martialis* and that of the specimen under discussion is hardly different. But are these slight differences of specific value? By no means. Compare figs. 4 and 6, which are drawn from undoubted *martialis*, with fig. 5, which is *ausonius*. (The view here is from a little further above than in figs 1 and 2.) Fig. 4 is the usual form, fig. 6 an extreme modification. Between these there may be found several intermediate forms. (These figures enlarged 22 times.)

The left clasp of *ausonius* does not differ from the usual left clasp of *martialis* as represented in figs. 7, 8 and 9.

Fig. 7 shows the tip of left clasp seen directly from the side (as the genitalia are mounted, enlarged 18 times).

Fig. 8 is the same seen from in front at an angle of about 45° (18 diameters).

Fig. 9 is the same from directly above (as the genitalia are mounted; 25 diameters).

I have been unable to find a specimen with which I can reconcile Scudder's representation of the apex of the left clasp and, if his figure is accurate, it must be looked upon as a departure from the usual pattern.

Figs. 11 and 12 show the apical half of right and left clasps respectively (after Scudder).

Fig. 10 represents the genitalia of *martialis* as seen from below (25 diameters) showing the angle at which the clasps in each instance were mounted for examination.

It will thus be seen that the modifications observed in the clasps of the individual named *Thanaos ausonius* are well within the limits of the variation exhibited by the species *T. martialis*.

I next removed with a bristle a few androconia from the costal fold of the left wing of "*ausonius*," and found them identical with the androconia of *martialis*.

The only other difference worthy of note is the absence of the hyaline spots. Of *martialis*, ninety-one females were examined and one hundred and twenty males. The number of such areas on a wing was found to vary from seven to three. The location of the several spots is shown in fig. 13 and for easy reference I have lettered them. No single specimen had more than seven of the possible eight, the one ♀ showing *a*, lacking *θ* within the cell. The most persistent of these spots are *ε*, *ζ* and *η*, all of which appear in each of the specimens examined. The ♀♀, as the more conservative element of the species, constantly show a tendency to retain all; the ♂♂ as the more variable element tend to lose them. As *ausonius* is a ♂ I shall here give only the results of my examination of the males.

<i>a</i>	was	missing	in	120,
<i>β</i>	"	"	"	111,
<i>θ</i>	"	"	"	109,
<i>γ</i>	"	"	"	19,
<i>δ</i>	"	"	"	6,
<i>ε, ζ, η</i>	were	"	"	0.

In three specimens *ε*, *ζ* and *η*, the only ones which persist, are greatly reduced and of rounded outline, and it does not seem to me that the loss of these is sufficient warrant for the specific distinction of a butterfly no second specimen of which has ever been taken.

These hyaline areas are little patches of the membrane which have been partially denuded of scales, the atrophied insertion of each one of which is plainly visible with a $\frac{1}{6}$ objective. But the denudation is only partial, many of the scales persisting, although for the most part wanting in pigment. Yet not always unpigmented, for occasionally a single one or a group is to be found furnished with the rich dark brown color of the submarginal spots in which the hyaline areas are set.

There can be no doubt but that *ausonius* is merely a color sport of *martialis*. The wings having been suffused and the fenestrate spots reclaimed by the scales under conditions which undoubtedly can be supplied in the laboratory but are not likely to occur very often in nature.

NOTES ON THE GENUS *CARIPETA* WITH DESCRIPTION OF A NEW SPECIES.

By LOUIS W. SWETT,

MALDEN, MASS.

In studying the genus *Caripeta*, I came across a strange error in the description and figuring of *Caripeta angustiorata* Walker, in Packard's Monograph of the Geometridæ. (Vol. X, U. S. Geol. Survey of the Territories, p. 238.) Entomologists in general have regarded, I believe, the insect figured by Packard in this monograph (Plate IX, fig. 52), as the true *C. angustiorata*, which I will prove is incorrect. While reading over the description I noticed it did not correspond exactly with the plate and this set me thinking, and I resolved to go over Packard's specimens in the Cambridge Museum of Comparative Zoölogy. To my surprise I found a very different insect from his figure, larger and with yellow streaks on the veins of the forewings, labelled "Smith, Norway, Me." (two specimens). Then I went over the collection carefully but could find no moth like the figure and I thought perhaps the labels had been changed, but I disproved this theory by finding a similar specimen (Packard mentions this in Monograph) in the Minot collection of the Boston Society of Natural History, through the kindness of Mr. C. Johnson. Working on these lines I found Strecker's description (Lep. Rhop. Het. Suppl. 2, 9, 1899), of *Caripeta seductaria* to correspond with Packard's insects, likewise to Walker's description of *C. angustiorata*. Having some ten specimens of each, that is, of Packard's figure, and his specimens of *angustiorata* corresponding to *seductaria* Streck., I sent a few to Sir George Hampson of the British Museum for comparison with Walker's types. He replied that Strecker's *C. seductaria* (like specimens in Packard collection at Cambridge), were Walker's *C. angustiorata*, this making *seductaria* a synonym of *angustiorata*.

In reference to the insect Packard figured, it has not been described, there being a similar specimen in the Grote collection bearing the label of *C. angustiorata*, which is, of course, wrong, as Walker's name has priority. Mr. Strecker, no doubt, made his mistake through Packard's plate. Holland, in his "Moth Book," figures the true *C. angustiorata* Walk. very clearly, and Packard in his Monograph figures (Plate 9, fig. 52) the insect I am going to describe. I wish to thank Dr. Dyar, of the U. S. National Museum for valuable information, also Mr. G. W. Taylor, of Wellington, B. C., Dr. Russel, of Winchendon, Mass., and Mr. C. W. Johnson for loan of specimens.

Caripeta crinitosa, new species.

Smaller than *C. angustiorata*; general color of fore wings dark reddish fawn; hind wings pale yellow. Tongue developed, palpi short, antennæ bipectinate in ♂, apex simple, in ♀ dentate; fore tibia with small tuft of blackish hairs, hind tibiae swollen; 2 pairs of spurs with hair pencil in the male.

Basal part of fore wing with triangular reddish patch, bordered by a silver white line of same shape, in some cases breaking through the median brown patch, completely separating and joining with outer silvery line; costal spot elongated, small, as a rule, not so large as in *angustiorata*; beyond is a silvery line running from costa to inner margin, usually broadened opposite discal dot and again opposite point of basal silver line; beyond an ochreous band, then a bluish white irregular band dotted with black atoms; fringe reddish brown, tipped with black. Hind wings with no markings, dotted near border with a few black atoms. Beneath pale yellow, more ochreous on veins and at margin of wings; a pale mesial band runs across secondaries, making two scallops.

Described from two ♂, Winchendon, Mass., one ♂, Franktown, Nevada (now in the British Museum), one ♀, Old Orchard, Maine, one ♀, Winchendon, Mass., and one ♂, Old Orchard, Maine (now in the U. S. National Museum, type no. 9802).

Can be separated from *C. angustiorata* by its smaller size, bluish line near border of fore wing, no silvery streaks on the veins extending to border and the black atoms on hind wings, with pale mesial line on under side.

SOME NEW GEOMETRIDÆ FROM ARIZONA.

BY GEO. W. TAYLOR,

WELLINGTON, B. C.

Among a number of Geometridæ kindly lent to me for study by the U. S. National Museum, I find several that are apparently new to science. Two of these, both belonging to the genus *Sabulodes* as defined by Hulst, are described in the present paper.

Sabulodes arizonata, new species.

Expanse 35 mm.

Palpi, head, thorax and abdomen and all wings above fawn color with an ochreous tinge, the female being of a rather brighter tint than the male.

Fore wings falcate, more evidently so in the female, hind wings distinctly angled at vein 4.

Fore wings crossed by 2 straight buff lines (bordered with whitish) more than twice as distant from one another on the costa as on the inner margin; discal points faint.

Hind wings hardly lighter than fore wings; a single straight extra discal line; discal points very small and indistinct.

Beneath uniform pale yellowish fawn, quite without markings in ♀, but with a few black specks and the very faintest indications of markings as above, in the ♂.

Described from three specimens: ♂, Huachuca Mts., Arizona, May 8-15, U. S. National Museum, type no. 9799; ♂, Cochise Co., Arizona; April 20, 1904, ♀, Cochise Co., Arizona, July 5, 1904, in my own collection.

The three specimens present slight differences and if it should prove that they are not conspecific, the first-named specimen must be considered the type of the present species.

Sabulodes arizonata belongs to that group in the genus which contains *truxaliata* Guenée, *cervinaria* Packard, *aurantiacaria* Packard and *novellata* Hulst. From the first three of these *arizonata* differs in having the inner line straight instead of gently curved. From *novellata*, which also has a straight inner line, it may be distinguished by the absence of any trace of a submarginal hair line above or below and by the approximation of the outer and inner lines on the inner margin of the fore wings.

***Sabulodes costinotata*, new species.**

Expanse 35 mm.

This is a species resembling, in almost everything except color, the ♀ of *S. arcasaria* (= *sulphurata* Pack.).

Palpi, head and collar dull purplish brown. Thorax, abdomen and upper surface of wings pale wood brown, paler than *S. fusciferata* Packard. Markings as in *sulphurata* except that both outer and inner lines are more evident. The outer line is continued across the hind wings but there is no conspicuous spot at the termination of this line on the inner margin of the wing as there is in *sulphurata*. Beneath the markings are reproduced as in *sulphurata*. Discal dots distinct above and below.

The type specimens are three in number and are all females: Durango, Colorado, U. S. Nat. Museum, type no. 9800; Phoenix, Arizona (two specimens), in my collection.

***Sicya snoviaria* Hulst.**

In the same collection (U. S. Nat. Mus.) there is another specimen on which I may comment here.

It is labelled "Santa Catalina Mts., Pinal Co., Arizona, April 8-15" and is a ♀ apparently conspecific with a ♂ in my own collection which I suppose to be the *Heterolocha snoviaria* Hulst, described from New Mexico. Hulst's type was a single ♂ and my specimen agrees well with the description except that it has a conspicuous basal line on the fore wing which is not mentioned by Hulst.

The ♀ specimen, however, has simple antennæ and very short palpi and therefore belongs to the genus *Sicya* and not to *Heterolocha* or *Neoterpes*. If my determination of *snoviaria* is correct, that species must be removed to *Sicya*; if otherwise then the specimens noted above will represent a new species in that genus.

DESCRIPTIONS OF TWO LEPIDOPTEROUS LARVÆ.

BY R. E. KUNZE, M.D., PHARM.D.,

PHOENIX, ARIZONA.

LARVA OF SPHINGICAMPA HEILIGBRODTHII HARVEY.

Every autumn I collect on the desert close to the Salt River, near Phoenix, a few of *Gyasutus obliteratus*, a good Buprestid found on Palo Verde (*Parkinsonia microphylla*) and while thus engaged found for the first time in nine years the larva of *heiligbrodthii*. This brilliant larva is readily detected, its silvered ornamentation reflected by

the sun makes it conspicuous on the tips of the minute-leaved Palo Verde, a small tree with few branches. Therefore it is impossible that on previous collecting, it could have escaped detection if present. I found the larva on September 28 and 29, 1904. From the size I judged it to be in latter part of third stage.

Larva covered by prominent spinulated tubercles, on a ground color of apple green. Face green, a white line on each side of triangular space, edged by a narrow black line. Mouthparts blackish. On joint 2, a circle of silvered granulation between spiracles. Thoracic tubercles spinulated, 6 mm. long. On joints 3 and 4, there are four spinulated tubercles, of which there are two on each side, one above the other. The subdorsal tubercle is of a purple or violet color, the lateral apple-green. Spinules of subdorsal tubercle black, those of lateral are green. From joints 5 and inclusive to 12 there are on each side two silvered tubercles, wedge-shaped, one above the other, the inferior resting on the infrspiracular line. All the lateral tubercles on inner side bright red. A circle of silvered granulations just back of tubercles of each joint. On joint 13, a spinulated tubercle, 4 mm. long, green on tip, reddish brown at base; spinules tipped with green and whitish at base. Three small, silvered tubercles on last joint above anal plate. Between the dorsal tubercles of each joint, two silvered granulations. Anal plate lined by a triangle of white granulations. Thoracic legs green, only granulated at base. Prolegs much granulated from base to feet or clasping part which is brownish. Abdominal part concolorous with dorsal. Spiracles black. Infrspiracular line pink with lilac reflection, much the same as in *H. io*.

Length at rest 29 mm. or $1\frac{1}{8}$ inch, in motion 32 mm. or $1\frac{1}{4}$ inch. Width 5 mm. or $\frac{1}{8}$ inch.

October 24, 1904, I discovered a full-grown larva of this Sphingicampid on a mesquite tree in a grove of my cactus garden, close to my tent-house, and on the second day went again to the desert, where I had taken the first larva, with the result of adding four more full-grown larvæ, of which one was crippled. I spent that day and the following hunting that larva—all on *P. microphylla*, the leaves of which are so very small that I offered a larger-leaved species, *Parkinsonia torreyana*, to my captures, which proved acceptable. I had *torreyana* growing in my garden and saved time by using it instead of the other. The cripple I put in alcohol, and mailed it to Prof. A. S. Packard. I noticed the following change in this second lot of larvæ, all of which pupated within two days after capture.

General color apple-green. Mouthparts brownish. Antennæ white. Outer or exterior side of the tubercles white, and but little spinose. Inner side pink, tipped white, at the base green, little spinose. Small tubercles silvered, tipped pink, cuneiform and pointed, the outer surface dazzling in the sunlight like a mirror. Dorsal row of tubercles longest, 2 mm. long. Subdorsal tubercles $1\frac{1}{2}$ mm. long.

A spinose tubercle on penultimate joint pink, tipped white, at base green. Spiracular line violet-lavender. Spiracles black, edged white. Thoracic feet green, toes brownish. Abdominal feet and toes brownish, at base green.

Length at rest, 45 mm.; in motion, 54 mm.; diameter 8 mm.

Larvæ pupated in stone jar, partly filled with a sandy loam, and a few weeks later removed three pupæ, of the usual shape of a *Sphingicampa*. May 10, 1905, a fine ♀ emerged, which during the night oviposited a few ova of a transparent, pea-green tint. August 8th another ♀ emerged which not being looked for, had become a total wreck. Of all the larvæ I ever have seen or bred East or West, this Sphingicampid is the most beautifully marked and ornamented. Its proper habitat is southeastern Texas and Mexico. I have received the imago from Comal County, Texas.

LARVA OF COPIDRYAS COSYRA DRUCE.

During August, 1904, I discovered some larvæ feeding on the tender young joints of a cactus — *Opuntia arbuscula*, a prickly-pear — having cylindric branches or segments, of which I cultivated a bed on my cactus ranch. The plants I had collected fifteen miles north of town in February of the same year. The larva was of cylindric shape, olivaceous in color, and more or less covered with fine hairs. I sent two to Dr. Harrison G. Dyar, with some of the foodplant. The larvæ were inflated for the U. S. Nat. Museum, but he was unable to recognize the insect. In the meantime I caged a number of good-sized larvæ in a stone jar containing loam, and obtained six or eight pupæ, which transformed a few inches below the surface. Early in the spring of 1905, I sent all these pupæ to Dr. Dyar, inasmuch as I had often to absent myself, collecting cacti all over this territory for export, and could not watch the pupæ. In due course of time Dr. Dyar informed me that he had obtained imagines of *Copidryas cosyra*, from the pupæ I sent him, and requested I should watch for more of these larvæ and take notes during breeding of the same.

Early in August I found this larva again on the prickly pear, from one half up to three fourths inch in length, and in a few days collected eleven or twelve larvæ. Not having an empty stone jar convenient, I had to place the young larvæ in a tin canister, which was kept inside of my tent-house. We had the hottest summer for a decade, with a temperature of 115 degrees in the shade and the larvæ were killed.

The first larvæ I found August 9, 1905, and the smallest measured 12 mm. in motion, and 2 mm. in width.

General ground color olivaceous brown. A white dorsal interrupted line, and two white subdorsal lines. On each joint a transverse row of short black tubercles, encircled by a white line. A long white hair from the point of the black tubercle. On joints 2, 3 and 4 were four tubercles, of which the middle ones were smallest. On joint 5 were four larger tubercles of equal size. On joint 6 were six tubercles, on joint 7 were eight tubercles, of which some very small. On joint 8 were six tubercles, two of which much larger. On joints 9 and 10 also six tubercles, but so small on the last, it was difficult to ascertain exact number. On joint 11 there were four tubercles in the row, preceded by two anteriorly on the dorsum. On joint 12 were placed six tubercles in two rows like the preceding segment, but larger. On the last joint four small tubercles. Head black with two white tubercles on occiput. Mouthparts blackish. Thoracic feet black. Clasper blackish.

August 10 noted a larva of 20 mm. length, 3 mm. width.

Head oval; a white triangular mark in the middle. On each side two convex bodies meeting at the vertex, shining, mottled olivaceous and white, covered by a few small white hairs. Mouthparts blackish. On the second joint twelve black tubercles, of which two dorsal and two subdorsal, the largest covered by hairs, and the four lowest crowded together. On third joint are twelve black tubercles, the four uppermost largest, and the lower lateral only one-fourth as large. On joint 4 the same. On joints 5, 6 and 7 the two tubercles each side of central dorsal line are larger than any other of the body. On joint 5 the smallest tubercles number five on each side, on joint 6 are five tubercles near intraspicular line, rather crowded, and on joint 7 are only four on each side. On joint 8 ten tubercles. On joint 9 and 10 twelve tubercles. On joint 11 ten tubercles, on the penultimate, twelve tubercles. On joint 13 are a number of minute, scattered tubercles. Below the clasper two larger black tubercles. Thoracic and abdominal legs black. The penultimate and preceding joint more brownish than olivaceous. Surface of body smooth, shining.

August 19, most of the larvæ perished. The last and largest was $28\frac{1}{2}$ mm. in length, and 6 mm. in width at the middle of the body, and 5 mm. at penultimate joint.

Longest hairs $4\frac{1}{2}$ mm. in length. The hairs on head and joint 2, as well as on the penultimate and last joint, only half so long. Width of head $3\frac{1}{2}$ mm. Face oval, ornamented by black spots. An irregular black groove between checks and vertex. Eyes black, edged white above. Lips whitish. Ground color ivory white. Four white longitudinal lines $\frac{1}{2}$ mm. in width, irregular in outline. Infraspicular line not quite so wide. There is more white color on joints 5 and 11 than any other. The white of joint 3 uniform in width. Tubercles on all joints longer, otherwise much the same. Joint 12 is much wider than any other. Anal plate irrorated black on white surface. Clasper much the same in color as the prolegs, with black on outer parts. Spiracles black, encircled by a white line. Exterior surface of thoracic feet pitchy black, shining, the same as external surface of prolegs. Inner side of thoracic feet cinereous. Inner side of prolegs white. Between prolegs the abdominal surface is a kind of pinkish ochraceous. On the segment anteriorly to prolegs, the black tubercles edged white, form a continuous band around body, but smaller on the abdominal surface, also hairs on the abdominal tubercles. The general ground color is more ligneous than olivaceous as previously.

Class I, HEXAPODA.

Order XI, ORTHOPTERA.

Order XII, DERMAPTERA.

REPORT ON THE ORTHOPTERA OF TRINIDAD,
WEST INDIES.

BY LAWRENCE BRUNER,

LINCOLN, NEBRASKA.

Several years ago Mr. H. D. Chipman collected insects on the Island of Trinidad, British West Indies, and the writer secured a fairly complete set of the Orthoptera taken by him. Since that time a few additional forms have been obtained from G. E. Trynane, of St. Anne's, Trinidad, and others from W. E. Broadway, of St. George's Grenada, who formerly collected on Trinidad. Altogether upwards of one hundred (112) species have thus been accumulated and form the basis of this paper.

Unlike others of the West Indies, this island is more closely related to the South American mainland in its fauna than they. Still a rather large number of new forms are described herewith, showing how very interesting is the study of island faunas, although but little removed from the mainland.

In 1892 Brunner von Wattenwyl and Prof. Joseph Redtenbacher published a paper on the Orthoptera of the Island of St. Vincent.* A little more than a year later Brunner von Wattenwyl reported on the Orthoptera of Grenada.† In the former paper fifteen and in the latter nine new species were described. Quite recently Mr. Jas. A. G. Rehn published some "Notes on West Indian Orthoptera, with a List of the Species Known from the Island of Porto Rico."‡

In the first-mentioned paper 62, in the second 56 and in the last 59 species are listed. Aside from these faunal papers on the Orthop-

* Proc. Zool. Soc. Lond., 1892, No. XV, pp. 196-222, Pls. xv-xvii.

† *Ib.*, 1893, pp. 599-611, Pl. lii.

‡ Trans. Amer. Ent. Soc., XXIX, pp. 129-136 (1903).

tera of the West Indies, that on the Orthoptera of Cuba by Ignacio Bolivar with 145 species, are the only important papers we have.

It may be inferred from these facts, however, that each of the other islands of the group will furnish undescribed genera and species of closely related forms — those that have become so differentiated by long isolation under changed environment. Why not institute a systematic campaign for learning what all of these nearby islands contain in the way of insect life? This should by rights be done by American entomologists.

The arrangement of the non-saltatorial families in this paper is after Kirby's Synonymic Catalogue of the Orthoptera, Vol. I.

Order DERMAPTERA.

Although the members of this order are not Orthoptera as now recognized, they have been so long considered as such that it is thought best to include them here. At least five species are at hand, four of which seem to be new. They are the following:

1. *Labia trinitatis*, new species.

A small, dark brown insect with a plain black head, pronotum, tegmina and wing sheaths, in which the disk of the abdomen above the forceps are reddish mahogany-colored. Body provided with a few stout bristles at sides of abdominal segments. Antennae 10-13 jointed, dusky at base but becoming paler apically — the last two or three being obscure testaceous. Legs of normal length, the femora moderately stout; the latter dull black except apically where they are testaceous, the tibiae, except on basal half where they are infuscated and tarsi pale testaceous. Head wider than the pronotum, the clypeus, labium and other mouthparts dirty testaceous. Pronotum about as long as wide, the sides parallel, hind margin broadly rounded, the front edge a little angulate, the shoulders each provided with a conspicuous anteriorly projecting bristle; the disk forward moderately convex and showing a well-defined longitudinal sulcus. Tegmina a little more than twice as long as broad, their apices gently obliquely truncate, the surface smooth and shining. Wing-sheaths fully developed. Abdomen broadened in the middle, segments 2 and 3 showing slight traces of lateral folds; the last dorsal segment of male abdomen a little narrowed behind, its posterior edge straight and possessing a slight protuberance above the base of each prong of the forceps. The latter short, moderately robust at base where they are widely separated, their inner edge provided with a carina which ends in a small tooth, parallel for about one third their length, beyond this tooth tapering and evenly curved so that the tips cross on outer fourth. The arms of the female forceps also quite robust at base, but tapering quite rapidly, the inner edges touching and the apices gently crossing.

Length of body, ♂, 5.5 mm., ♀, 5.25 mm., of forceps, ♂, 1.1 mm., ♀, .85 mm.

Habitat. — Island of Trinidad, H. D. Chipman, collector, 1 ♂ and 1 ♀.

2. *Labia insularis*, new species.

A medium-sized, almost naked, smooth-bodied insect with from 14- to 16-jointed antennæ, and in which the wing-sheaths are largely testaceous in the center basally. Basal joint of antennæ and legs pale testaceous, the latter somewhat infuscated on the femora mesially and tibiæ basally. The labrum, together with labial and maxillary palpi, also somewhat pale-colored. Head dull black, the eyes large and prominent, rather coarsely granulate. Pronotum about as broad as long, the sides gently bowed; dull black, becoming brownish on the thinner lateral edges. Tegmina brown with a small testaceous longitudinal shoulder streak, about twice as long as their greatest width, their apices obliquely docked, the truncation gently concave. Wing-sheaths moderately large, reaching to the middle of third abdominal segment. Abdomen with the surface polished and only delicately punctate, the sides convex, broadest about the middle; the disk above dark mahogany brown, the base, apex and sides much darker, nearly or quite black; lower side testaceous basally becoming ferruginous apically. Forceps moderately stout, nearly straight and provided internally basally with a short flattened plate or projection the edges of which touch, beyond irregularly crenulate, scarcely toothed, the apices gently crossed.

Length of body ♀ (?), 8.5 mm; of forceps, 1.85 mm.

Habitat. — Island of Trinidad, West Indies, H. D. Chipman, collector.

In this insect the last dorsal segment of the abdomen is a trifle more than three and one half times as broad as long, coarsely punctulate, the sides gently rounded and converging posteriorly, the hind edge straight; middle of posterior portion lowered and provided with a central shallow depression.

3. *Labia modesta*, new species.

Very similar in general appearance to the preceding but differing from it in its somewhat smaller size, slightly more hairy body, the fewer antennal joints (13-14), the absence of the testaceous shoulder stripes on the tegmina, the smaller basal light spots of wing sheaths which in the present form are lateral rather than central — there being no border of the dark color externally as in *L. insularis*. Here the thin lateral edges of the gradually broadening pronotum are transparent. The disk of dorsal segments 4, 5, and 6 are brownish testaceous. Lower side along with legs pale testaceous, the latter, with the femora above strongly infuscated. Last dorsal segment smooth, about twice as wide as long, narrowing behind, the middle triangularly depressed between centers of bases of the two prongs of forceps and provided with a series of small, round, wart-like raised points. Forceps with their inner edges not laminate, not quite touching basally, evenly tapering, carinate above, crenulate on inner edge, the points crossing.

Length of body, ♂, 7 mm.; of forceps, 1.6 mm.

Habitat. — Island of Trinidad, West Indies, H. D. Chipman, collector, a single specimen.

4. *Labia pictipennis*, new species.

A large rather robust black species with ferruginous head, small black eyes and yellowish testaceous legs in which the tegmina and wing-sheaths are each provided with a large conspicuous spot of a bright yellowish orange color. The pronotum also more or less strongly bordered at sides with yellowish testaceous, sometimes its disk anteriorly likewise ferrugineo-testaceous. Antennæ 13- to 15-jointed, the two basal and one half of the third of the same color as head, the third and fourth joints from the apex are pale testaceous, remaining joints black. Whole insect sparsely clothed with rather long stiff hairs or bristles which are especially noticeable on the hind edges of femora and abdominal segments. Pronotum small, narrower than the head, about as long as wide, a little narrowed behind, the latter margin rounded; anterior half of disk roundly convex, with a well-marked longitudinal sulcus which becomes very pronounced on the depressed posterior half where it seems to issue from between two diverging, backward pointing carinæ. Tegmina about two and one half times as long as broad, their apices slightly obliquely docked; wing sheaths reaching a little beyond the apex of the second abdominal segment. Abdomen somewhat broadening at middle; last dorsal segment about twice as wide as long, a little narrowing behind, and provided above with faint longitudinal grooves or scratches. Anal forceps simple, short, heavy, triangular, their inner edges not quite touching at base, bluntly toothed or crenulate within, the tips crossing.

Length of body, ♂, 16-17 mm.; of forceps, 2.55 mm.

Habitat. — Trinidad Island, H. D. Chipman, collector, 2 ♂.

Joints 1 and 2 of tarsi are unusually hairy below.

5. *Spongiphora croceipennis* var. *parallela* Westwood.

Forficula parallela Westw., in Guer. Mag. Zool., VII, pl. 178 (1837).

Forficula longiforcipata Blanch, in d'Orbigny Voy. Am. Merid., VI, ii, Ins. p. 214, pl. 26, fig. 1 (1837-1843).

Forficesila longissima J. G. Wood, Ins. Abroad, p. 279, fig. 139 (1877).

Spongiphora croceipennis parallela Bormans, Tierr., 11 Lief., p. 56 (1900).

This species is represented by six specimens which were collected by H. D. Chipman. They belong to the variety ♂, according to A. de Bormans and H. Krauss (see Thierreich, 11 Lieferung, p. 56).

No doubt several other genera and species of the Forficulidæ are represented on the island.

Order ORTHOPTERA.

Family BLATTIDÆ.

6. *Anaplecta* sp.

There is a single specimen of this genus at hand that has not yet been determined. It was taken by Chipman at Port of Spain.

7. *Chorisoneura mysteca* Sauss.?

A second small cockroach that was taken at the same place by Mr. Chipman is referred here with some doubt.

8. *Ischnoptera* sp.

A single specimen about the size of, and bearing considerable resemblance to *I. uhleriana* Sauss., was taken near Port of Spain by Chipman.

9. *Phyllodromia notata* Brunner ?

Phyllodromia notata Brunner, Proc. Zool. Soc. Lond., 1893, p. 602, pl. 52, figs. 1 *a*, *b*.

There are two specimens from near Port of Spain that appear to belong to Brunner's *P. notata*. They were also collected by Chipman.

10. *Phyllodromia adpersicollis* Stål.

Blatta adpersi ollis Stål, Eugenie's Resa, Ins., p. 308 (1858); Sauss., Miss. Mex., Orthopt., p. 35, pl. 1, fig. 22 (1870).

Phyllodromia adpersicollis Brunn., Syst. Blatt., p. 107 (1865).

Blatta nahua Sauss., Rev. Zool., Ser. 2, XX, p. 355 (1868); Sauss. and Zehntn. Biol. Cent. Amer. Orth., I, p. 42, pl. 4, figs. 19-21 (1893).

This species is represented by six specimens, all of which were taken near Port of Spain by H. D. Chipman. It seems to be one of the few species which in time is destined to become widely spread in tropical countries.

11. *Phyllodromia conspersa* Brunner.

Phyllodromia conspersa Brunn., Syst. Blatt., p. 106, No. 24 (1865).

The collections received from Mr. H. D. Chipman contain two specimens of this species. They were collected on the Island of Trinidad.

12. *Phyllodromia* sp.

There are two specimens of a pale species of this genus which are a trifle smaller than the preceding. They were collected by Mr. Chipman and sent to me along with a number of other interesting Orthoptera taken near Port of Spain.

13. *Phyllodromia infuscata*, new species.

Still another and rather slender small species of this genus is represented by a single specimen taken by Chipman near Port of Spain on Trinidad Island. It seems to be new.

Dark piceous, with paler border to the pronotum in front and on the sides, and on the costal margin of the elytra as well. The pronotum is marked on the disk pos-

teriorly by a rather large triangular yellow spot that gives off a narrow forward projecting shoot in its middle. The head is dark, save about the base of antennæ and clypeus, where the color is testaceous. Venter pale, with a dusky vitta on each side of the middle. Cerci heavy, 10-jointed, the basal one testaceous, the rest dark. Length to tip of wings, 10.5 millimeters.

The type is in the writer's collection.

14. *Phyllodromia* (?) *binotata*, new species.

A single ♀ (?) specimen from H. D. Chipman is included in this genus with much doubt. It is dark colored and has the femora almost destitute of spines; the tegmina are a little longer than the abdomen and veined similarly to those of *Phyllodromia*. The cerci are rather incrassate, but acuminate, 9- or 10-jointed. The antennæ are coarse and the joints decidedly moniliform in appearance. The characteristic marking is two small pale triangular spots on the disk of the pronotum towards its hind margin.

Length, including wings, 9.5 millimeters.

15. *Pseudophyllodromia* sp.

Two specimens are placed in this genus, but no attempt has been made to determine the species. These insects are in the collection obtained from Chipman. They were taken near Port of Spain. In color they are dark piceous with pale legs, lateral borders of pronotum and costal margin of tegmina. In size they measure 8 millimeters, including tegmina and wings.

16. *Nyctobora mexicana* Sauss.

Nyctobora mexicana Sauss., Rev. et. Mag. Zool., XIV, p. 227 (1862).

Nyctobora stygia Walk., Cat. Blatt., Brit. Mus., p. 148, No. 9 (1868).

A single female specimen collected on the Island of Trinidad and sent to me by W. E. Broadway, of St. George's, Island of Grenada, is placed here.

17. *Phoraspis* sp.

There is a single somewhat mutilated specimen of *Phoraspis* before me from Trinidad Island. It was taken by W. E. Broadway, from whom it was obtained along with some other miscellaneous orthopterous insects. This insect is somewhat similar to *P. pantherina*, but differs from it in having the sides of the pronotum and anterior lateral margins of the tegmina testaceous and evenly conspersed with black.

18. *Epilampra cribrosa* Burmeister?

1 ♂ and 3 ♀♀ from H. D. Chipman, who collected them in the woods near Port of Spain.

19. *Epilampra brevis* Brunner?

There are a like number of a second species from the same locality and person which seem to belong to Brunner's *E. brevis*.

20. *Blatta (Stylopiga) meridionalis*, new species.

A medium-sized species of glossy black color in which both sexes are entirely apterous, not showing even the slightest signs of the aborted lateral tegmina as figured for *insularis*. The distinguishing characteristic of the species, however, is the dirty white palpi, which are very conspicuous in comparison with the otherwise general pitchy black color of the insect.

In size this cockroach is somewhat smaller than *orientalis*. It is also more compactly built and darker colored, while its entire body is smooth and impunctate. The only variation from the general black color, except the palpi as indicated above, are the antennæ on their apical half, the legs on their coxæ, the front edge of the femora, the knees and parts of the tarsi which incline to rufo-piceous. The legs are quite strongly spined. The spines on the posterior edge of the anterior femora both above and below are much smaller than those on the other legs, the number fourteen or fifteen in each row. The middle and hind pairs have this part provided with a series of seven both above and below. The apical dorsal segment or supraanal plate of the ♀ abdomen is triangular with its tip evenly rounded, while the last ventral is prow-shaped and pointed. In the ♂ the upper plate is slightly transverse with rounded lateral edges and a slight longitudinal median furrow which gives to it a somewhat bilobed appearance. The cerci are moderately long and robust in both sexes.

Length of body, ♂, 16, ♀, 23; of pronotum, ♂, 4, ♀, 5.40; greatest width of pronotum ♂, 6, ♀, 7 millimeters.

Habitat. — Island of Trinidad, 1 ♂, 1 ♀ (H. D. Chipman, collector).

The types are in the author's collection.

21. *Periplaneta americana* Linneus.

This cosmopolitan species is represented by several specimens. It was also collected by Mr. Chipman, presumably in Port of Spain.

22. *Periplaneta australasiæ* Fabricius.

Likewise from Port of Spain. Taken by Chipman. Like the preceding a cosmopolitan insect, but more especially confined to the warmer parts that are visited by ocean shipping.

23. *Leucophæa surinamensis* Linneus.

There are also several specimens of the above-named cosmopolitan roach. They come from Mr. Chipman and were taken in the interior of the Island of Trinidad.

24. *Panchlora virescens* Thunberg.

Blatta virescens Thunb., Mem. Acad. St. Petersburg, X, p. 278 (1826); Serv., Ins. Orthoptera, p. 101 (1839).

Blatta (*Pachlora*) *virescens* Guer., in Ramon de la Sagra, Hist. Cuba, Ins., p. 344 (1857).

Two female specimens of the genus without the black dots on the elytra are placed here. Collected by H. D. Chipman.

25. *Panchlora viridis* Burmeister.

Panchlora viridis Burm., Handb. Ent., ii, p. 506 (1838).

Panchlora poeyi Sauss., Rev. et Mag. de Zool., 1862, p. 230; Ib., Mem. Blatt., p. 194 (♂).

A single male from Chipman taken near Port of Spain seems to agree perfectly with the description of *viridis*. It also lacks the dot on the tegmina.

26. *Panchlora peruana* Sauss.

This, the most abundant as well as widely distributed species of the genus, is represented by a pair. They were also taken by Mr. Chipman in the forests on the Island of Trinidad. It is the insect that is most frequently carried in bunches of bananas to various parts of the United States. One or two of the other species are likewise thus carried.

27. *Archimandrita marmorata* Stoll?

Blatta marmorata Stoll, Spectres, Blattes, p. 3, pl. 2d, fig. 5 (1813).

Blabera marmorata Sauss., Mem. Mex. Blatt., p. 249 (1864); Brunn., Syst. Blatt., p. 378 (1865).

Archimandrita marmorata Sauss., & Zehntn. Biol. Cent. Amer., I, p. 116 (1894).

A single mature nymph is placed here with some doubt. It certainly does not belong to the next genus. Collected by W. E. Broadway.

28. *Blabera stollii* Brunner.

Blatta gigantea Stoll, Rep. Spectres, etc., p. 2, Pl. 1d, fig. 1 (1813).

Blabera stollii Brunn., Syst. Blatt., p. 374 (1865).

A single specimen of this giant cockroach was sent to me by W. E. Broadway who collected it on the Island of Trinidad.

29. *Blabera fusca* Brunner.

Blabera fusca Brunn., Syst. Blatt., p. 376 (1865).

A single female specimen from near Port of Spain is placed here. It was collected by H. D. Chipman.

30. *Blabera cubensis* Saussure.

Blabera cubensis Sauss., Rev. et Mag. de Zool., Ser. 2, XVI, p. 347 (1864).

Blabera subspureata Walk., Cat. Blatt. Brit. Mus., p. 4 (1864).

This species is represented by but a single specimen, a female, that was collected at the same time and place with the preceding by Chipman.

These large blattids are not plentiful although there are numerous forms, many of which are rather widely distributed. They usually come into collections a specimen at a time.

31. *Latindia castanea* Brunner.

Latindia castanea Brunn., Proc. Zool. Soc. Lond., 1893, p. 604.

A single individual from near Port of Spain, H. D. Chipman collector.

Family MANTIDÆ.

32. *Acontista multicolor* Saussure.

Acontista multicolor Sauss., Mitth. Schweiz. Ent. Ges. III, p. 229 (1870).

Two undoubted females and four possible males of this species are before me as I write. They were taken by H. D. Chipman.

33. *Tithrone roseipennis* Saussure.

Acontista roseipennis Sauss., Mitth., Schweiz. Ent. Ges. III, 229 (1870).

Tithrone roseipennis, Sauss. & Zehntn., Vol. I, p. 139 (1894).

Three specimens, 1 ♂ and 2 ♀♀, are at hand. H. D. Chipman, collector.

34. *Liturgousa cayennensis* Saussure.

Two females of this insect are among the material received from H. D. Chipman. They come from the interior of the island.

35. *Mionyx surinamus* Saussure.

Thespis surinama Sauss., Mitth., Schweiz. Ent. Ges. III, p. 70 (1869).

Meconia surinamæ Stål., Bihang. Svenska Akad., iv, pp. 63, 64 (1877).

One specimen, a male, was taken along with the preceding by Mr. Chipman.

36. *Acanthops* sp.

W. E. Broadway sent me two specimens of an *Acanthops* which he collected on the Island of Trinidad several years ago. They are dead-leaf brown and about the size and form of *A. godmani* Sauss. Their much darker color, however, seems to indicate their distinctness. It is hardly possible that this is an undescribed species.

37. *Oxyops rubicunda* Stoll.

Mantis rubicunda Stoll, Repts. Spectres, Mantes, p. 73, Pl. 25, fig. 26 (1813).

Stagmatoptera diluta, ♂ (nec ♀), Sauss., Mem. Mex. Mant., p. 87, pl. 1, fig. 6 (1871).

A single specimen, a female, is at hand. It was collected and sent to me from Port of Spain by H. D. Chipman.

38. *Parastagmatoptera vitrepennis*, new species.

Most closely related to *P. unipuncta* (Burm.) and *P. tessellata* Sauss. et Zehnt., from both of which it differs in its somewhat smaller size, slenderer form (?) and shorter tegmina. The prothorax is almost without the marginal dentation of *unipuncta*, while the tegmina are considerably shorter than the wings. The marginal field of the former is green and opaque on the basal half.

Lower inner apical third of coxæ black. Prothorax, coxæ and femora, together with antennæ and marginal border of folded tegmina and outer portion wings, testaceo ferruginous; the head and tibiae with a greenish tinge. Greater portion of the tegmina and wings vitreous, very faintly greenish tinged.

Length of body, ♂, 34, of pronotum, 12, width of its dilation, 2.15, length of tegmina, 24, width of tegmina, 6, of the marginal field, 1.4 mm.

Habitat. — A single male, Trinidad, W. I. (H. D. Chipman, Coll.) The type is in the author's collection.

39. *Stagmatoptera præcaria* Linneus.

Gryllus (*Mantis*) *præcarius* Linn., Syst. Nat. (ed. X), I, p. 426, No. 7 (1758).

Mantis præcaria DeGeer, Mem. Ins., III, pp. 406, 407, No. 3, pl. 37, figs. 4, 8, 9 (1773).

And a number of synonyms.

Habitat. — W. E. Broadway has sent me 1 ♂ and 2 ♀♀ of this common large South American mantis. It was collected on the Island of Trinidad.

Family PHASMIDÆ.

40. *Clonistria linearis* Drury?

Mantis linearis Dru., Illustr. Exot. Ent. I, pl. 50, fig. 3 (1773).

Bacteria linearis Gray, Syn. Phasm., p. 17 (1835); Westw. Cat. Phasm. Brit. Mus., p. 24, No. 64 (1859).

(?) *Clonistria linearis* Rehn, Proc. Acad. Nat. Sci. Philad., 1904, p. 60.

Pseudobacteria longiceps Kby., Ann. Nat. Hist. (6), III, p. 503 (1889).

The collections contain a number of immature Phasmids from Trinidad, while only two fully matured specimens are at hand. A male may be the *linearis* of Drury. If so, a female taken at the same time may prove to be its female. It is of a very dark gray-brown

color, rather robust in form, somewhat granulose, and provided with 3 longitudinal carinæ on the dorsum of thorax and abdomen, on the latter the median one is looped or linked so as to appear as a chain, a link to a segment. The head is provided on the occiput, with two fairly prominent short spines or horns between and a little back of the eyes. The legs are a trifle more robust and shorter than those of the male, while its antennæ are also much shorter. Its length is 50 mm.

A number of younger specimens show a great variation in color. Some are green, others testaceous and still others ferruginous.

41. *Acanthoclonia histrinus* Westwood.

Ceroys histrinus Westw., Cat. Phasm. Brit. Mus., p. 60, No. 156, pl. 1, fig. 5.

A single female specimen by H. D. Chipman on Trinidad.

Family ACRIDIDÆ.

Subfamily TETTIGINÆ.

42. *Amorphopus notabilis* Serville.

Amorphopus notabilis Serv., Hist. Nat. Ins. Orthopt., p. 757, pl. 13, fig. 2 (1839).

There are two specimens, ♂, and ♀, in the collection made by H. D. Chipman on the Island of Trinidad. One of these was examined by Dr. J. L. Hancock.

43. *Amorphopus antennatus* Bolivar.

Amorphopus antennatus Bol., Essai des Tettig., p. 77, pl. 11, figs. 19, 19a-b (1887).

Of this species the collections contain nine specimens. They were collected by Messrs. Chipman and Broadway. It is the common species of the genus in Central America, the West Indies and northern South America.

44. *Tettix gracilis*, new species

A small and very slender species in which the median carina of the pronotum is slightly arched just back of its anterior margin, less prominent elsewhere but quite plain throughout. The entire insect is rather finely and sharply granular. Vertex about as wide as the diameter of the prominent eyes, with a strong median carina, but little advanced in front of the eyes; frontal costa broad and very prominent between the antennæ.

Length of body, ♂, 6, of pronotum, 9.5, of hind femora, 4 mm.

Habitat. — Trinidad, West Indies, 2 males. H. D. Chipman.

These specimens were examined by Dr. Hancock and pronounced not typical, but still evidently belonging to the genus *Tettix*.

45. *Allotettix chipmani*, new species.

A very graceful species with unusually elongated pronotum and wings. Eyes rather prominent, the vertex about as wide as one of the eyes, only a trifle projecting beyond their anterior edge, broadly sulcate and provided with a strong median carina which reaches back nearly to the front edge of the pronotum, antero lateral edges rounded and furnished with prominent carinæ. Face rounded and furnished with prominent carinæ. Face viewed in profile rather oblique, strongly sinuate, the frontal costa between the antennæ profound and deeply sulcate, gently widening below. Antennæ arising just below the eyes, slender. Ocelli located about the middle of inner edge of eyes, of ordinary size. Pronotum narrow, the process greatly attenuate and surpassing the tips of hind femora by their own length; the median carina percurrent, a little prominent in advance of the humeral angles just back of the anterior margin; the latter squarely truncate; disk of pronotum both rugose and finely granulate, the rugæ, particularly in widest portion, inclining to form longitudinal or diagonal carinæ; lower posterior angles rounded. Tegmina normal. Anterior and middle femora not clypeate, about normal, the hind femora a little elongate. First and third joints of hind tarsi subequal.

General color dull black or brown, conspersed with testaceous, much paler beneath. Tarsal joints black-tipped. Wings dusky apically, and with the disk dark purplish pearl color.

Length of body, ♂, 7 mm., ♀, 9 mm.; of pronotum, ♂, 12 mm., ♀, 14-15 mm.; of hind femora, ♂, 5 mm., ♀, 6-6.25 mm.

Habitat. — Island of Trinidad and adjoining portions of British Guiana, H. D. Chipman and R. J. Crew, collectors, many specimens of both sexes (Coll. L. Bruner).

46. *Micronotus quadriundulatus* Redtenbacher.

Tettix quadriundulatus Redt., Proc. Zool. Soc. Lond., 1892, p. 208, Pl. XVI, fig. 10.

This insect is represented by several specimens of both sexes. H. D. Chipman, collector.

An examination of this material seems to indicate that *quadriundulatus* is either very variable or else there are two or more closely related species found upon the island of Trinidad. In the first examination a smoother form with but three undulations of the pronotum was set aside under the name *Micronotus hancocki*. Another and later examination reveals a third form in which there are five such undulations. To definitely settle this matter a much larger series of specimens is necessary.

Two or three additional forms appear among the excellent collection of these interesting little locusts that were received from Mr. Chipman, but they will be reported on at a later date after they have

been critically studied by Dr. J. L. Hancock, who is making a special study of the subfamily.

47. *Tettigidea trinitatis*, new species.

Characterized by its rather slender form, small size, spicate anterior edge and evenly granulate surface of pronotum above, the long wings and pronotal process, and by the pale lower half of body and anterior and middle legs of male.

Pronotum with the antero-dorsal edge strongly angulate and produced upon the occiput in an acute forward projecting spine that reaches as far as the middle of upper edges of the rather large and prominent eyes. Vertex rather narrow, a little more than half the diameter of one of the eyes, projecting slightly in advance of them. Frontal costa narrow, not prominent, deeply sulcate. Antennæ moderately long, pale basally in the males, more or less annulate in the females. Face not greatly oblique. Tegmina narrow, the lower apical edge broadly rounded, the upper apical edge angulate, crossed just before the apex by an oblique narrow pale patch. Hind femora robust in the female, usually provided with a median broad pale band. General color varying from pale to obscure brown, the legs and abdomen of the female more or less conspersed and banded with testaceous. Head of male below the base of antennæ and eyes uniformly dirty white; lower lateral edges of pronotum, all of under side, front and middle legs, base of hind femora, tips of hind tibiæ, the tarsi and most of abdomen also of this color.

Length of body, ♂, 6.75–7 mm., ♀, 9 mm.; of pronotum, ♂, 8 mm., ♀, 9.5 mm.; of hind femora, ♂, 4.60–4.75, ♀, 5.5–6 mm.

Habitat.—2 ♂ and 6 ♀, Trinidad Island, H. D. Chipman, collector (Coll. L. Bruner).

48. *Tettigidea imperfecta*, new species.

A small dark-colored, slender-bodied insect with greatly abbreviated wings and small narrow apically light blotched tegmina, in which the process of pronotum scarcely reaches the tip of the abdomen. Very finely granulate and without the short lateral longitudinal ridges so commonly met with on the disk of the pronotum in various species of the genus; median carina prominent throughout, the disk anteriorly gently tectate; antero-dorsal edge decidedly angulate but not cuspidate in the single ♀ now before the writer, though a ♂ nymph of what is apparently the same species has the anteriorly projecting spine strongly developed. Eyes of moderate size; width of vertex a trifle more than one half of the longest diameter of eyes, slightly advanced in front, broadly and shallowly sulcate and without a median carina save at the extreme anterior edge. Face somewhat oblique and sinuate when viewed from the side; frontal costa quite prominent between the antennæ, sulcate, its greatest width slightly more than that of basal antennal joint. Posterior femora robust and uncommonly smooth even for the genus. Valves of the ovipositor short and slender.

General color above uniform dark brown, almost black, the lower side, together with legs, varied with dirty testaceous; the anterior and middle tibiæ annulate with black—all the feet black-tipped.

Length of body, ♀, 9 mm.; of pronotum, 8 mm.; of hind femora, 5.5 mm.

Habitat. — 1 ♀ and perhaps also a ♂ nymph, Island of Trinidad, West Indies, collected by H. D. Chipman (Coll. L. Bruner.)

49 *Paurotarsus rugosus*, new species.

Rather robust and with the surface of pronotum and head above more than commonly rugose, the rugæ on disk of former appearing as numerous blunt longitudinal ridges of varying length. The sexes not greatly unequal in size.

Head short and broad; eyes rather small and separated above by a space a little wider than their greatest diameter; vertex broadly convex, very rough, notched laterally at middle of eyes, considerably advanced in front, provided in the middle with a prominent carina, the antero-lateral edges rounded and provided with well-marked carinæ, which, however, do not reach the middle in front. Frontal costa very prominent and broad, the lateral edges heavy and rather profoundly divergent below, sulcate from the extreme vertex. Lateral facial carinæ strong, arcuate, extending from the base of the antennæ to lateral edges of base of clypeus. Lateral ocelli very prominent, situated above the middle of inner edges of eyes and against the sides of frontal costa. Antennæ filiform, 18- or 19-jointed, about reaching the base of tegmina, situated a trifle above a line drawn from the lower edge of eyes, the basal joint rather large. Posterior lateral angle of pronotum not at all produced, the lower and posterior edges meeting in a right-angle. Antero-dorsal process of pronotum not advanced upon the occiput; in both sexes extending slightly beyond the tip of the hind femora, the latter slightly surpassing the apex of abdomen; tip of male abdomen long and tapering, apex of last ventral segment rather deeply notched; valves of ovipositor long and wedge-shaped, rather strongly serrate. Hind femora large and course, somewhat longer in proportion to the size of the insect than usual in members of the Tettiginæ.

General color dull brownish black, more or less varied on pronotum above and on the legs with dirty ferrugineo-testaceous — the venter irregularly mottled with testaceous, the valves of ovipositor pale with darker apex.

Length of body, ♂, 11 mm., ♀, 13 mm.; of pronotum, ♂ 11 mm., ♀, 12.5 mm.; of hind femora, ♂, 6.5 mm., ♀, 7.25 mm.

Habitat. — 1 ♂ and 1 ♀, Island of Trinidad, West Indies, H. D., Chipman, collector (Coll. L. Bruner).

Subfamily EUTRYXALINÆ.

50. *Eumastax* sp.

A single nymph of a species of *Eumastax* was collected and sent to me by G. E. Tryhane, of St. Anne's. It seems to be most closely related to the *E. plebja* Gerst., but in the absence of mature specimens cannot be definitely determined.

Subfamily TRYXALINÆ.

51. *Amblytropidia trinitatis* Bruner.

Amblytropidia trinitatis Bruner, Biol. Cent. Amer. Orthopt., II, p. 65 (1924).

This species is represented by seven males and three females collected by Mr. H. D. Chipman near Port of Spain. It also occurs on the main land at Demerara, British Guiana.

52. *Orphullela punctata* DeGeer.

Acrydium punctatum DeG., Mem. Hist. Ins., III, p. 503, pl. 42, fig. 12 (1773).

Orphula punctata Stål, Recens. Orthopt., I, pp. 106, 107 (1873).

Orphula (*Orphullela*) *punctata* Gig.-Tos, Boll. Mus. Zool. Torino, IX, No. 184, p. 12 (1894).

Several specimens of both sexes. They were taken at various localities on the island by all the collectors.

While the genus contains numerous representatives in North and Middle America, there is but little doubt as to the identity of DeGeer's species.

53. *Orphullela chipmani*, new species.

A small species of variable color with the lateral carinæ of the pronotum parallel in advance of the hind transverse sulcus, and with unusually narrow tegmina.

Occiput somewhat elongate, the eyes large but not prominent, the fastigium slightly acuminate even in the female, shallowly sulcate; lateral foveolæ small, linear, scarcely sulcate, frontal costa prominent only above, very shallowly sulcate and with the sides gently divergent below. Antennæ slender, filiform, short, in the male only a trifle exceeding, in the female somewhat less than the combined length of head and pronotum together. Pronotum a little expanding behind, the two lobes equal in length, the lateral carinæ parallel in advance of the last or principal sulcus. Tegmina narrow, the discoidal area in the ♀ containing but a single row of cells, just about reaching the apex of abdomen and hind femora in the female, equal to the latter but longer than the former in the male. Hind femora with basal half robust, apical half slender, immaculate.

Color variable, but usually green or testaceous on occiput, disc of pronotum and dorsal field of tegmina. Sides of head, back of eyes, upper half of sides of pronotum and pleuræ, and disk and costal field of tegmina dark fuscous; face, lower portion of cheeks, sides of pronotum, pleuræ, hind femora, abdomen and under side pale (male). In the female the fuscous band back of the eyes is much narrower and confined to the upper edge of the sides of pronotum and the tegmina are much paler and show traces of maculation. The wings are fuliginous or fuscous, darkest apically. Hind femora somewhat obscure on the knees, and the hind tibiae along with all the tarsi also infuscated.

Length of body, ♂, 12-13, ♀, 18; of pronotum, ♂, 2.2, ♀, 2.9; of tegmina, ♂, 9.5-10, ♀, 12-13; of hind femora, ♂, 7.5 ♀, 9.5 mm.

Habitat.—Interior of Island of Trinidad, several specimens of both sexes. H. D. Chipman, collector.

54. *Orphullela insularis*, new species.

Specimens of what appear to be a third species of *Orphullela* are among the collections received from both Mr. Chipman and Mr. Tryhane. They are about the size of the preceding from which they differ in their slightly more robust form, the shorter and somewhat flattened antennæ, the smaller eyes, the more obtuse fastigium of the vertex, the gently arcuate lateral carinæ of the pronotum, the slightly broader tegmina and more robust hind femora. In color they vary from a pale brunneo-testaceous to a dull brown. Some female specimens show the usual dusky pronotal and pleural markings, while others are without them. Both the males and the females have the tegmina quite evenly maculate with pale to darker fuscous patches similar to those so characteristic in the considerably larger *O. punctata* DeGeer. The hind femora of the males have prominent traces of a fuscous band across the upper edge, while the lower outer carina is adorned with 4 to 6 elongate fuscous maculations. Anterior and middle tibiæ fasciate with fuscous, the hind tibiæ somewhat infusate. Sides of basal abdominal segments piceous.

Length of body, ♂, 13.5, ♀, 18; of pronotum, ♂, 2.9, ♀, 3.25; of tegmina, ♂, 12, ♀, 13.5; of hind femora, ♂, 8, ♀, 9.5-10 mm.

Habitat. — Trinidad, West Indies.

This insect will run close to *meridionalis* Bruner, in the synoptic table of the genus as given in the Biologia Centrali Americana, but by comparison with that species shows a number of differences.

Subfamily ACRIDIINÆ.

55. *Prionolopha serrata* Linnaeus.

There are at hand two males and a female of this widely distributed South American locust. They were received from H. D. Chipmann, who collected them on the Island of Trinidad.

56. *Tropidacris dux* Drury.

One male and two females (H. D. Chipman), a pair (W. E. Broadway), and female (G. E. Tryhane).

For the synonymy of this handsome large locust see Scudder's article entitled "A Study of the Giant Lobe-crested Grasshoppers of South and Central America."

57. *Prionacris* ? sp.

Mr. G. E. Tryhane sent to me among other interesting Orthoptera taken on the Island of Trinidad a young nymph which seems to belong to the genus *Prionacris*. It is black, marked with dashes of yellow. There are three such markings, which are oblique, on each side of the disk of the pronotum, and the hind femora are thrice banded with the same color.

Group LEPTYSMINI and allies.

From the collections at hand it would appear that at least one half of the American genera of Acridians with the dilated and acute-edged hind tibiæ are represented on the Island of Trinidad. This being true, and because there is likewise a new genus now to be added to the group, a synoptic table of the genera is herewith given:

TABLE FOR THE SEPARATION OF THE AMERICAN GENERA OF LEPTYSMA
AND ALLIES.*

* This table is a modification of Giglio-Tos' (Bolletino dei Musei di Zoologia ed Anatomia comparata della R. Università di Torino, No. 311, XIII, pp. 40-50, 1898).

- A.* Posterior tibiæ slightly expanding apically, the margins acute.
 - b.* Mesosternal lobes with their inner edges nearly straight and touching for most of their length. Elytra acuminate.
 - c.* Fastigium of the vertex as long as, or longer than, the longest diameter of eyes.
 - d.* Fastigium of the vertex furnished with decided longitudinal grooves or sulci.
 - e.* With but a single profound sulcus **Leptysma** Stål.
 - ee.* With four such narrow but well-defined sulci.
 - Leptysmina** G. Tos.
 - dd.* Fastigium of the vertex without definite longitudinal sulci.
 - Cylindrotettix** n. gen.
 - cc.* Fastigium of the vertex shorter than the eyes..... **Arnilia** Stål.
 - bb.* Mesosternal lobes more or less distant. Tegmina subacuminate or rounded at apex.
 - c.* Posterior margin of the pronotum rounded.
 - d.* Tubercle of the prosternum transverse, broad, the apex truncate.
 - Oxybleptella** G. Tos.
 - dd.* Tubercle of the pronotum conical, more or less acute.
 - e.* Body very graceful or slender. The front strongly oblique. Head much exserted, conical. Antennæ distinctly ensiform. Eyes rather elongate, viewed from above strongly convergent, meeting at an acute angle. Pronotum distinctly dilated posteriorly, the lower edge of sides straight, oblique. Tegmina somewhat dilated toward apex..... **Inusia** G. Tos.
 - ee.* Body heavier. The front less oblique. Head only gently exserted, not conical. Antennæ filiform, or a little subensiform. Eyes not at all or but little elongated, when viewed from above slightly convergent, forming an obtuse angle. Pronotum not or but little dilated posteriorly; the lower edge of sides straight on posterior half, emarginate on anterior half. Tegmina narrow towards apex.

- f.* Pronotum cylindrical, the dorsum straight viewed laterally, the metazona not elevated. Frontal costa below the ocellus and the lateral carinae of the face subobsolete. Eyes rather oblique, less prominent.....**Stenopola** Stål.
- ff.* Pronotum gently dilated posteriorly, the dorsum when viewed laterally sinuate, subselliform, the metazona gently elevated, the humeral angles rather distinct. Frontal costa and lateral carinae of the face distinct. Eyes less oblique and strongly prominent..**Henia** G. Tos.
- cc.* Posterior margin of the pronotum obtusangulate.
- d.* Angle of the posterior margin of the pronotum entire, not incised. Tegmina greatly surpassing the hind femora.
- e.* Frontal costa rather prominent between the antennae, subdilated. Eyes rather strongly convergent and somewhat remote from the front edge of the pronotum. Tegmina with their apices subacuminate**Cornops** Scudd.
- ee.* Frontal costa less prominent between the antennae, not dilated. Eyes less convergent, not distant from the front edge of the pronotum. Tegmina with their apices distinctly rounded.
- Paracornops** G. Tos.
- dd.* Angle of the posterior margin of the pronotum greatly incised. Tegmina not surpassing the hind femora.
- e.* Frontal costa percurrent, sulcate throughout. Fastigium of vertex subhorizontal.....**Mastusia** Stål.
- ee.* Frontal costa subobsolete below the ocellus, not sulcate. Fastigium declivant.....**Tetratænia** Stål.
- AA.* Posterior tibiae not or but little expanded apically, the margins rounded.

Copiocera Burm.

58. *Leptysmia minima*, new species.

Cylindrical, slender, small. General color (alcoholic) pale ferrugineo-testaceous, without any signs of the usual paler or darker elongate lateral lines.

Head large, considerably longer and a little wider than the front edge of the pronotum. Eyes large, oblique, not prominent, a little longer than that portion of the cheeks below them. The fastigium separated from the very narrow vertex by a rather deep notch, suddenly expanded so as to become even with the outer front edge of the eyes and a little longer than one of them, roundly angulate in front and provided with a broad and rather profound median sulcus. Antennae as long as the head and pronotum combined, broadly ensiform. Pronotum pinched laterally in the middle, a little broader in front than behind, the surface somewhat punctate, especially on the hind lobe, which is much shorter than the anterior one. Tegmina long, narrow, lanceolate, with comparatively few veins, extending somewhat beyond the apex of the abdomen. Hind femora slender and weak, much shorter than the abdomen. Hind tibiae with 16 spines in outer row and 25 in inner row.

Length of body, ♀, 29; of head, 6; of pronotum, 3.5; of hind femora, 10; of tegmina 23 mm.

Habitat. — Island of Trinidad, W. E. Broadway, collector (Coll. L. Bruner).

This insect is nearest to *L. gracilis* Bruner, a species that comes from Brazil and which has recently been recognized as distinct from *L. filiformis* Serv. It has been described in the Proceedings of the U. S. National Museum in connection with other forms from South America.

Genus CYLINDROTETTIX new.

Aside from the characters mentioned in the foregoing table a few additional characters should be given as follows: Head long and pointed; the eyes very oblique, not prominent, about as far apart above as the width of the second antennal joint; fastigium equally as long as the eyes, its upper side rounded, its apex as in *Leptysmina*, antennæ strongly ensiform, as long as the head and pronotum together, frontal costa prominent and sulcate above the ocellus to a point slightly in advance of the apex of fastigium where it suddenly narrows to a mere ridge, below the ocellus faint. Pronotum a trifle longer than the occiput, its surface strongly punctulate, all three transverse sulci well-defined, the median carina present but not prominent except on the hind lobe; front and hind margins rounded above, the former with the middle squarely docked. Prosternal spine of moderate size and enlarged apically, gently directed to the rear. Legs weak, slender and short; hind femora reaching but little beyond the basal two thirds of abdomen; hind tibiæ considerably shorter than the femora, with nine or ten weak spines in outer row. Tegmina long and slender, reaching considerably beyond the tip of the abdomen. Valves of the ovipositor rather short and tapering rapidly towards the moderately hooked apices; the upper ones provided above basally with a single prominent black tubercle, the lower pair each with three fairly large tubercles.

59. *Cylindrotettix insularis*, new species.

General color grass-green with a ferruginous tinge to thorax above and tegmina. The usual greenish-white line beginning at lower posterior edge of eyes and passing back to lower edge of pronotum and across pleuræ to base of hind femora. Face apple-green; antennæ ferruginous, eyes æneous; anterior and middle legs green; lower side pale greenish yellow.

♀. Length of body, 38-42; of antennæ, 14; of fastigium, 3; of pronotum, 5.75; of tegmina, 33-36; of hind femora, 15.5 mm.

Habitat. — 2 ♀♀, Trinidad Island, West Indies, H. D. Chipman, collector (Coll. L. Bruner).

60. *Arnilia cylindrodes* Stål?

There is a single male specimen of *Arnilia* in the collection from Trinidad which is determined with some doubt as Stål's *Opsomala cylindrodes*. Although it agrees well with a female specimen taken by the writer at Victoria, Brazil, and another from Demerara, British Guiana, a careful comparison of the structure of the last ventral segment of the male abdomen in specimens from Florida, Mexico and South America, shows this to vary much. Our North American

(Southeastern U. S.) specimens are certainly distinct from those coming from South America. These insects will be more carefully examined later and the results published in a special paper now in course of preparation.

61. *Inusia chimpani*, new species.

Very similar to *I. gracillima* G.-Tos, but differing from it in its somewhat larger size and darker color.

Head, except on the sides back of the eyes, strongly punctate. Eyes prominent, separated above by a very narrow space which is sulcate; the fastigium somewhat ascending, elongate, triangular, shorter than the eyes, rugosely punctate or verrucose, carinate anteriorly. Face viewed in profile broadly concave, the median costa sulcate and coarsely punctate; lateral carinae sharp. Antennae distinctly but not broadly ensiform, nearly as long as the hind femora. Pronotum somewhat dilated on the posterior lobe, punctate, more strongly so on the hind lobe. Lower lateral edges in the female straight, in the male a very little sinuate. Tegmina considerably surpassing both the abdomen and hind femora, the extreme apex subacuminate. Hind femora just reaching (♀) or considerably surpassing (♂) the apex of the abdomen, their genicular lobes somewhat acuminate. Hind tibiae only gently dilated apically, provided externally with seven and internally with nine spines. Last ventral segment of male abdomen short and rather blunt, the apex entire. Valves of ovipositor short and slender.

General color above dark fusco-ferruginous, below greenish testaceous, separated on the sides by a narrow, deep black band which reaches from the hind edge of the eyes to just above the base of the hind femora. The latter greenish, their apices with a ferruginous tinge and marked on their inner genae with black; hind tibiae pale glaucous, infuscated basally. Dorsum of abdomen fuscous. Antennae dark ferruginous. Wings infuscated.

Length of body, ♂, 20, ♀, 25; of pronotum, ♂, 3.9, ♀, 4.5; of tegmina, ♂, 20, ♀, 24; of hind femora, ♂, 11.5, ♀, 14 mm.

Habitat.—Island of Trinidad, six males and one female, H. D. Chipman, collector, 1 ♂, W. E. Broadway (Coll. L. Bruner).

This insect occurs in British Guiana as well. Still another species of the genus is found in portions of Mexico and Central America.

62. *Stenopola limbatipectennis* Stål?

Three males and one female from the interior of the island are referred here with some doubt. They were collected by H. D. Chipman.

63. *Cornops bivittatum* Scudder?

Another species of these aquatic or subaquatic Arctridians, which was taken by Mr. Chipman is represented by three specimens 1 ♂ and 2 ♀♀. It is doubtfully referred to Scudder's *Cornops bivittatum* until it can be studied more carefully.

64. *Copiocera erythrogastra* Perty.

Niphocera erythrogastra Perty., Delect. Anim. Artic., p. 122, pl. 24, fig. 2 (1830).

Copiocera erythrogastra Brum., Handb. Ent., II, p. 612 (1838).

?*Gryllus euceros* Marschall, Ann. Wien. Mus., 1836, p. 206, pl. 18, fig. 8 (1836).

A single female of this species was sent to me by Mr. H. D. Chipman, who took it on Trinidad.

65. *Vilerna æneo-oculata* DeGeer.

Acridium æneo-oculatum DeG., Mem. III, p. 502, pl. 42, fig. 11 (1773).

Vilerna æneo-oculata Stål, Recens. Orthopt., I, p. 71 (1873).

Acridium sanguinipes Serv., Hist. Orthopt., p. 670 (1839).

A number of specimens of both sexes taken by H. D. Chipman, on Trinidad. I also have specimens from British Guiana.

66. *Sitalces trinitatis*, new species.

Rather above the medium in size, a little robust. Sides of head, lower edges of pronotum and pleura to base of middle legs marked with a white line. The male with a broad pale dorsal band and green legs. The female without the pale dorsal band, the legs ferrugineo-testaceous, heavily conspersed with fuscous. Hind tibiae deep glaucous.

Head a little wider than the front edge of the pronotum, eyes large and prominent, æneous; vertex as broad as the first (♀) or the second (♂) antennal joint, the fastigium slightly depressed, blunt; lateral foveolæ subquadrate, about the size and just in front of the ocelli; frontal costa prominent above, of nearly equal width, continuous and gently sulcate to the clypeus, coarsely punctate above the sulcus. Pronotum without lateral carinæ, coarsely punctate, a little expanding on the posterior lobe which is only half as long as the anterior one, the transverse sulci rather profound, anterior edge truncate, the posterior edge of disk a little emarginate, lower edges strongly sinuose. Tegmina spatulate, long and slender, quite (♂) or nearly (♀) reaching the hind margin of the first abdominal segment. Hind femora comparatively robust, reaching the apex of the abdomen in the female, or surpassing it in the male by the length of the knees. Prosternal spine broad at base, the apex acuminate. Hind tibiae 8-spined in outer row. Legs and apex of abdomen hirsute.

Head of male dirty white except a triangular patch on the occiput, sides of head back of eyes, a little patch below each antenna and the lower margin of cheeks and labrum which are deep brown or black. In the female the head is dark ferruginous varied with fuscous save on the cheeks below where it is much paler. Palpi white. Pronotum of the male deep chocolate brown except the pale dorsal stripe and lower edges, becoming black immediately where joining the pale portions; meso- and metathorax similarly colored as is also the first abdominal segment; segments 2-4 with broad lateral black patches. Sides of metathorax with a narrow oblique white line. Hind femora in male pale olive green, palest inside and below, the apical lunules alone black or piceous; in the female brownish testaceous with an oblique fuscous band on outer face of basal half and some dusky marks along the carinæ, inner face largely black as are also the apical lunules. Sides of abdominal segments 2 to 4 less broadly black than in the males.

Length of body, ♂, 15, ♀, 18; of pronotum, ♂, 3.3, ♀, 3.85; of tegmina, ♂, 2.85, ♀, 3; of hind femora, ♂, 9, ♀, 10.5 mm.

Habitat. — Island of Trinidad, a single pair in coitu, taken by G. E. Tryhane, of St. Anne's (Coll. L. Bruner).

67. *Schistocerca columbina* Thunberg.

Gryllus columbinus Thunb., Mem. Acad. St. Pétersb., IX, p. 399, 425 (1824).

Acridium (*Schistocerca*) *columbinum* Stål, Recens. Orthopt., I, p. 67 (1873).

Schistocerca columbina Brunn.-Redt., Proc. Zool. Soc. Lond., 1892, p. 210.

Although no specimens of this insect are at hand in the material before me it is known to occur on the Island of Trinidad, as well as on the mainland and most of the West Indian Islands. It is smaller than *S. simulatrix* Walker, to which it bears some resemblance.

68. *Schistocerca simulatrix* Walker.

Cyrtacanthaeris simulatrix Walk., Cat. Derm. Salt. Brit. Mus., IV, p. 610 (1870).

Schistocerca simulatrix Scudd., Proc. Amer. Acad. Arts. Sciences, XXXIV, p. 454 (1899).

There are three specimens of what seems to be Walker's *simulatrix* at hand. They were collected by H. D. Chipman.

69. *Schistocerca pallens* Thunberg.

Gryllus pallens Thunb., Mem. Acad. St. Pétersb., V, p. 237 (1815).

Acridium (*Schistocerca*) *pallens* Brunn.-Redt., Proc. Zool. Soc. Lond., 1892, p. 210.

This last locust is widely distributed over tropical America, and while no specimens are contained in the collections at hand from Trinidad, it is known to occur on that island.

70. *Schistocerca americana* Drury.

There are two specimens, 1 ♂ and 1 ♀, at hand from Trinidad. They were received from W. E. Broadway.

The synonymy of this species can be ascertained by referring to Scudder's paper entitled "The Genus *Schistocerca*."

71. *Osmilia cœlestis* Burmeister.

Acridium cœlestre Burm., Handb. Ent., II, p. 634 (1838).

Osmilia cœlestis Brunn., Proc. Zool. Soc. Lond., 1893, p. 606.

This insect is represented by a rather large number of specimens of both sexes. They were taken by both H. D. Chipman and G. E. Tryhane. It also occurs on the Island of Grenada, as well as in British Guiana and other parts of tropical South America.

Just how it differs from *Gryllus violaceus* of Thunberg I cannot say, not having had the time to examine into the matter carefully.

Family LOCUSTIDÆ.

72. *Anaulacomera antillarum* Brunner.

Anaulacomera antillarum Brunn., Proc. Zool. Soc. Lond., 189, p. 607.

A single ♀ of this species is before me from Trinidad. It was collected by H. D. Chipman.

73. *Anaulacomera furcata* Brunner.

Anaulacomera furcata Brunn., Monog. Phaneropt., p. 287 (1878).

One specimen, a female, was sent to me by Mr. Chipman, who collected it on the Island of Trinidad.

75. *Anaulacomera laticauda* Brunner?

Anaulacomera laticauda Brunn., Monog. Phaneropt., p. 292 (1878).

Still another species of the genus is represented by a single male and female. They seem to belong to *A. laticauda*, but do not quite agree with Brunner's description. As it is a more or less variable insect, I am inclined to place it here rather than with *lativertex*, from which it differs also. It was collected by H. D. Chipman.

76. *Ctenophlebia zetterstedti* Stål

Phylloptera zetterstedti Stål, Orthopt. Freg. Eugene, Resa, p. 322 (1860).

Ctenophlebia zetterstedti, Stål, Recens Orthopt., 2, p. 37.

Two males of this insect were received from Chipman, who collected them in the interior of the Island of Trinidad.

77. *Plagioptera bicordata* Serville.

Locusta bicordata Serv., Ency. Meth., X, p. 143 (1825).

Pycnopalpa bicordata Serv., Hist. Orthopt., p. 408 (1838).

Plagioptera bicordata Brunn., Monog. Phaneropt., p. 323, pl. VII, fig. 93 (1878).

Only a single female of this oddly marked katydid is at hand. It was captured and sent to me by Mr. H. D. Chipman. He took it in Trinidad.

78. *Microcentrum angustatum* Brunner?

Microcentrum angustatum Brunn., Monogr. Phaneropt., p. 335 (1878).

A single male is placed here. It was taken by Chipman on Trinidad Island.

79. *Microcentrum lanceolatum* Burmeister.

Phylloptera lanceolata Burm., Handb. Ent., II, p. 692 (1839).

Microcentrum lanceolatum Brunn., Monogr. Phaneropt., p. 335, pl. VII, fig. 97 (1878).

Phylloptera laurifolia de Haan, Bijdr., p. 197.

Phylloptera salviaefolia Sauss., Orthopt., Nov. Amer., p. 8.

Two females collected by Chipman are determined as belonging to this species.

80. *Philophyllia guttulata* Stål.

Philophyllia guttulata Stål., Ofv. Vet. Akad. Forhandb., 30, 4, p. 40 (1873); Brunn., Monogr. Phaneropt., p. 350, fig. 102 (1878).

Locusta laurifolia Thunb., Mem. Acad. St. Pétersb., V, p. 281 (1815).

The collections contain a male from Chipman and a female from W. E. Broadway.

81. *Philophyllia latior* Brunner.

Philophyllia latior Brunn., Monogr. Phaneropt., p. 551 (1878).

A single female of this second species of the genus is at hand, H. D. Chipman, collector.

82. *Stilpnochlora marginella* Serville.

Phylloptera marginella Serv., Hist. Ins. Orthopt., p. 405 (1839).

Stilpnochlora marginella Stål, Recens Orthopt., 2, p. 44.

Phylloptera thoracica Burm., Handb. Ent. II, p. 693 (1838).

Microcentrum thoracicum Scudd., Bost. Journ. Nat. Hist., VIII, p. 447.

Phylloptera coulontiana Sauss., Rev. et Mag. Zool. (?), XIII, p. 128 (♀) (1861).

A male specimen of this common large katydid was sent to me by W. E. Broadway who collected it on the Island of Trinidad.

83. *Peucestes coronatus* Stål.

Peucestes coronatus Stål, Recens Orthopt., 2, p. 45; Brunner, Monogr. Phaneropt. p. 366 (1878); Sauss. et Pict. Biol. Cent. Amer., I, p. 307, pl. XVIII, fig. 1, ♀ (1898).

Two beautiful specimens, both males, were taken by H. D. Chipman.

Subfamily PSEUDOPHYLLINÆ.

84. *Brisilis chipmani*, new species.

General color griseous varied with fuscous. About the size of *B. tenebrosa*, but differing from that species in color and by having the hind wings tessellate instead of unicolorous.

Front piceous bordered with black. Inner basal half of mandibles also black. Sides and disk of pronotum more or less varied with fuscous, the hind lobe unitubercu-

late on each side of disk in front. Tegmina having a sort of maculate appearance due to the fuscous background and the pale testaceous veins, nervures and veinlets, the latter of which are drawn together in clusters leaving darker spots without them. Spines of legs compressed or flattened, hairy and more or less curved apically; 3-5 minute ones on the inner side of anterior, 4 larger on outer side of intermediate, and 9 on outer carina of posterior femora; those on hind tibiae above strong, inside 12 and longer, outside 10 and weaker. Hind femora with a dash of black internally near the base. Ovipositor serrato-crenulate on upper edge, near the apex with three transverse rugæ and the same number of round tubercles. Subgenital plate triangular with the apex rather acutely and deeply emarginate. Pro-, meso-, and metasternum together with inner side of middle and hind femora, and the middle tibiae shining black. Ovipositor piceous, inclining to black apically. Antennæ broadly annulate with pale and dusky.

Length of body, ♂, 35, ♀, 40-42; of pronotum, ♂, 8.25, ♀, 10.15; of tegmina, ♂, 4.5, ♀, 53-57; of anterior femora, ♂, 13, ♀, 15; of hind femora, ♂, 26, ♀, 31-34; of ovipositor, 27-29 mm.

Habitat. — Island of Trinidad, H. D. Chipman, collector, 2 ♂, 1 ♀, W. E. Broadway.

85. *Platyphyllum* (?) *modestum*, new species.

Rather below the medium in size, testaceous varied with small fuscous streaks along the veins of tegmina.

Front strongly oblique, testaceous. Pronotum rugose, the transverse sulci deep. Tegmina rough, testaceous varied with a few dark streaks along the veins. Meso- and metasternum unicolorous, dark testaceous. Wings a little infuscated, not tessellate. Legs shortly pilose. Anterior femora a little compressed and arcuate at base, above carinate on apical third, 5-spined below on anterior margin; middle pair 4-spined; anterior and middle tibiae without spines above; hind femora 7- or 8-spined. Subgenital plate triangular, not notched. Ovipositor of moderate size, nearly straight, the disk towards the apex provided with two or three transverse rugæ, pale at base, piceous at apex.

Length of body, ♀, 29, of pronotum, 6.75, of tegmina, 28, width of tegmina, 7, length of anterior femora, 9, of hind femora, 17, of ovipositor, 14 mm.

Habitat. — Island of Trinidad, H. D. Chipman, collector. A single female specimen.

This insect does not agree very well with the diagnosis of the genus *Platyphyllum*, but insisted on running there when going over the synoptic table of genera in Brunner's Monograph of the Pseudophyllidæ.

86. *Meronicidius atrispinosus*, new species.

A little above the medium in size, anterior and middle femora provided with four black spines; hind femora 8-spined, these likewise black.

Testaceous. Antennæ unicolorous, testaceous. Pronotum unicolorous, rather

coarsely granulose, very faintly tuberculate in front, the transverse sulci rather profound, especially the posterior one; lateral lobes with the lower edge very strongly bordered. Tegmina surpassing the tips of hind femora and nearly reaching the apex of the ovipositor, their posterior edge faintly brownish piceous, otherwise testaceous. Wings ample, infumate, the cross-veins fuscous. Ovipositor not unusually heavy or long, its apical third tapering, the apex slender and gently upcurved, black, the basal part testaceous. Last ventral segment or subgenital plate broadly bilobed, the middle deeply emarginate, the apex of the lobes truncate. Disk of ovipositor without any distinct rugae.

Length of body, ♀, 42, of pronotum, 9, of tegmina, 48, width of tegmina, 11, length of anterior femora, 14, of hind femora, 30 mm.

Habitat. — Island of Trinidad, 1 ♀, W. E. Broadway, collector.

There is before me a second ♀ specimen taken by the same person, which lacks the spines on the anterior femora as well as all traces of the auditory apparatus. Otherwise, the two are the same in every respect. It is possible that this second insect met with an accident very early in its life which resulted in the removal of auditory apparatus and spines. Not only the spines on the legs but a space about their base is likewise black.

87. *Bliastes insularis*, new species.

Size medium or small. General color pale testaceous. Occiput provided with a large triangular black patch, the apex of which is directed anteriorly; the fastigium and down middle of face to ocellus shiny black; base of the clypeus and lower face, together with the labrum, black. Antennæ pale testaceous throughout. Pronotum granulose, the posterior lobe shortest and having the lateral angles and hind margin blackish; last transverse sulcus back of the middle, quite profound. Tegmina rather narrow, their apex rounded, all the veins and veinlets pale testaceous, near the base with a faint greenish tinge, the background pale brown giving these members a slightly speckled appearance where the veinlets are missing or further apart than usual. Wings likewise pale, a very little infuscated apically. Anterior femora 4-spined; intermediate 3-spined; hind pair with 5-7 pale-colored ones that are black-tipped. Genicular lobes of hind femora both internally and externally rounded. Anterior and middle tibiae above without spines, the former somewhat fuscous on upper side save at auditory apparatus which is testaceous, giving to it a banded appearance. Ovipositor gently curved, dark piceous, the base and a longitudinal median line testaceous.

Length of body, ♀, 34; of pronotum, 6; of tegmina, 36; of hind femora, 18 mm.

Habitat. — Island of Trinidad, West Indies, January, two females, H. D. Chipman, collector.

88. *Diophanes perspicillatus* Stoll.

Perspicillata Stoll, Rept. Spect., etc., pl. VIII, a, figs. 23, 24 (1787).

Diophanes perspicillatus Brunn., Monog. Pseudophyll., p. 242, fig. 109 (1895).

Locusta salwifolium Licht, Trans. Linn. Soc. Lond., IV, p. 51.

Platyphyllum salwifolium Brulle, Hist. Nat. Ins., X, p. 139.

Diophanes rosaceus Stål, Obs. Orthopt., I, p. 39 (1875).

W. E. Broadway sent me a single female of this beautiful insect with the statement that it was captured on the Island of Trinidad.

Subfamily CONOCEPHALINÆ.

89. *Exocephala viridis* Redtenbacher.

Exocephala viridis Redt., Monog. Conocephalidæ, p. 347, 33 (1891).

A single female specimen of this species was collected on Trinidad Island and sent to the writer by H. D. Chipman.

90. *Conocephalus guttatus* Serville.

Conocephalus guttatus Serv., Hist. Ins. Orthopt., p. 518 (1839).

Conocephalus guttatus Redt., Monog. Conocephal., p. 78, 392, fig. 33 (1891).

? *Gryllus obtusus* Stoll., Spectres, etc., pl. XVIII, b, fig. 64 (1815).

This species is represented by three females (H. D. Chipman, collector).

91. *Conocephalus pichinchæ* Bolivar.

Conocephalus pichinchæ Bol., Artropods Viaje al Pacif., p. 100 (1884); Redt., Monog. Conocephal., p. 78, 392, 1891.

One male (H. D. Chipman).

92. *Conocephalus maxillosus* Fabricius.

Locusta maxillosa Fabr., Ent. Syst., II, p. 37 (1794).

Conocephalus maxillosus Serv., Hist. Ins. Orthopt., p. 520 (1839).

There are two specimens of this species before me. One, a male, was collected by H. D. Chipman, and the other, a female, was received from W. E. Broadway.

93. *Conocephalus frater* Redtenbacher.

Conocephalus frater Redt., Monog. Conocephal., p. 85, 399, 1891.

Only a single male of this species is at hand. It comes from Mr. Chipman, who took it on Trinidad Island.

94. *Conocephalus nigrolimbatus* Redtenbacher.

Conocephalus nigrolimbatus Redt., Monog. Conocephal., p. 87, 401, 1891.

This is the fifth *Conocephalus* at hand from Trinidad. It is a male specimen from Mr. Chipman.

95. *Xiphidium propinquum* Redtenbacher.

Xiphidium propinquum Redt., Monog. Conocephal., p. 208, 522 (1891).

There are two females of a species of *Xiphidium* at hand which are determined as above. They were received from Mr. G. E. Tryhane, of St. Anne's, Trinidad.

96. *Thysdrus virens* Thunberg.

Thysdrus virens Thunb., Mem. Acad. St. Pétersb., V, p. 274 (1815); Redt., Monog. Conocephal., p. 224, 538 (1891).

Phlugis chrysopa Bol., Orthopt. Cuba, p. 37 (1888).

Four female specimens from H. D. Chipman and one from Mr. Tryhane represent this widely distributed species.

97. *Thysdrus mantispa* Bolivar.

Phlugis mantispa Bol., Orthopt. Cuba, p. 39 (1888).

Only a single specimen of this insect is at hand. It comes from H. D. Chipman who took it on the Island of Trinidad.

Family GRYLLIDÆ.

Subfamily GRYLLOTALPINÆ.

98. *Gryllotalpa hexadactyla* Perty.

Gryllotalpa hexadactyla Perty, Del. Anim. Artic. Brasil, p. 119, pl. 23, fig. 9 (1830).

This widely distributed mole cricket of the tropics was taken by Chipman. One specimen is before me.

99. *Scapteriscus didactylus* Latreille

Gryllotalpa didactyla Latr., Hist. Nat. Crust. et Ins., XII, p. 122 (1802).

Scapteriscus didactylus Scudd., Mem. Peabody Acad. Sci., I, p. 10, pl. 1, figs. 1, 14 (1869).

This second mole cricket was collected by both Broadway and Chipman. A number of specimens are in the collections which form the bases for this report. This insect is a plague in some of the sugar cane fields of tropical America.

Subfamily TRIDACTYLINÆ.

100. *Tridactylus (Heteropus) histrio* Saussure.

Tridactylus (Heteropus) histrio Sauss., Biol. Cent. Amer. Orthopt., I, p. 207 (1896).

There are several specimens of this little cricket before me. They were collected by H. D. Chipman on the Island of Trinidad.

101. *Rhipipteryx rivularia* Saussure.

Rhipipteryx rivularia Sauss., Biol. Cent. Amer. Orthopt., I, p. 212, pl. XI, fig. 20 (1896).

Seventeen individuals represent this really pretty little insect. They come from Chipman and Tryhane. No doubt several other representatives of the subfamily are to be found on the island.

Subfamily GRYLLINÆ.

102. *Nemobius trinitatis* Scudder.

Nemobius trinitatis Scudd., Journ. N. Y. Ent. Soc., IV, p. 104 (1896).

Mr. Chipman also sent a single female of this species. It agrees with Scudder's description in every respect.

103. *Anurogryllus muticus* DeGeer.

Gryllus muticus DeG., Mem. Ins., III, p. 520, pl. 43, fig. 2 (♀).

Grylloides muticus Sauss., Miss. Scient. Mex., Orthopt., p. 411, 1 (♂, ♀), pl. 7, fig. 9 (♂).

I find a male specimen among a small collection of pinned insects which was recently received from W. E. Broadway. He collected it on the Island of Trinidad.

104. *Gryllus assimilis* Fabricius.

Gryllus assimilis Fabr., Syst. Ent., p. 280 (1775).

Gryllus assimilis Sauss., Miss. Mex., Orthopt., p. 396, pl. 8, figs. 27-29 (1870).

Gryllus verticalis Serv., Hist. Orthop., p. 343 (♀) (1839).

Gryllus antecus Sauss., Rev. et Mag. Zool., XI, p. 316 (1859).

Gryllus cubensis Sauss., Rev. et Mag. Zool., XI, p. 316 (1859).

These names, together with a number of others used by Walker and some of the different writers on Orthoptera, constitute the synonymy of the present species.

Only a single female specimen collected by Mr. Chipman is at hand, from the Island of Trinidad.

105. *Miogryllus pusillus* Burmeister.

Gryllus pusillus Burm., Handb. Ent., II, p. 733 (1838); Sauss., Mel. Orthopt., 5e Fasc., p. 362, pl. XI, fig. 7.

Grylloides pusillus Sauss., Miss. Scient. Mex., Orthopt., p. 416, pl. 7, fig. 6 (♀).

Miogryllus pusillus Sauss., Biol. Cent. Amer. Orthopt., I, p. 227.

This is still another South American cricket that has found its way to the Island of Trinidad. It is represented by a single male that was obtained by Mr. Chipman who sent me about all of the good things.

Subfamily MYRMECOPHYLINÆ.

106. *Ectatoderus insularis*, new species.

The present species is most nearly related to *E. alatus* Sauss., a Brazilian insect, from which it differs in being considerably larger, in lacking the pale border to the

posterior edges of the pronotum and abdominal segments and in having the disk of the pronotum ferruginous instead of brownish testaceous. The pronotum is broadly rounded behind and projects beyond the pronotum about one half as far as their extreme width; the tegmina are testaceous, and have their sides and apex broadly bordered with fuscous; the speculum is triangular.

General color of head, legs and wings testaceous, more or less varied with pale brown; pronotum ferruginous, abdomen fuscous inclining to black apically. The entire insect is sparsely squamulose and hirsute, the legs especially are provided with a number of long bristle-like hairs.

Length of body, ♂, 10.5; of pronotum, 3.8; of tegmina beyond the pronotum, 2; of hind femora, 6.25 mm.

Habitat. — A single male collected on the Island of Trinidad by H. D. Chipman. (Coll. L. Bruner.)

This specimen is more or less mutilated, being much rubbed and minus the cerci. In some respects it seems to agree more closely to the genus *Liphophus* but in its facial and hind tarsal characters agrees more closely with *Ectatoderus*.

Subfamily TRIGONIDINÆ.

107. *Cyrtoxiphus gundlachi* Saussure.

Cyrtoxiphus gundlachi Sauss., Miss. Scient. Mex., Orthopt., p. 373 (1870).

A single male specimen received from H. D. Chipman is referred here.

108. *Cyrtoxiphus vittatus* Bolivar?

Cyrtoxiphus vittatus Bol., Mem. Soc. Zool. France., I, p. 159 (1888).

A pair of little crickets belonging to a second species of this genus from Trinidad are referred doubtfully to *vittatus* since this species seems to be quite generally distributed throughout the West Indies. Mr. Chipman was the collector.

Subfamily ECANTHINÆ.

109. *Ectecous cantans* Saussure.

Ectecous cantans Sauss., Biol. Cent. Amer. Orthopt., I, p. 244, pl. XII, figs. 8, 9, 10 (1899).

I have a single male specimen which has been determined as this species. It was collected by Chipman.

110. *Ecanthus immaculatus*, new species.

A long, slender-bodied, pale, greenish-white species without any trace of black dots or other markings on face or basal antennal joints. Tegmina reaching tip of hind femora, the wings caudate, fully 4 mm. longer than the elytra. Hind

tibiæ provided with three rather conspicuous spines on inner side of apical third, and two less conspicuous ones on outer side. Pronotum about twice as long as broad, the greatest width immediately above the base of anterior legs. Ovipositor rather heavy and with the apical portion gently upturned; anal stylets longer than ovipositor, quite slender, and roundly bent downwards on outer third.

Length of body, 13.5 mm.; of pronotum, 2.9 mm.; of tegmina, 12 mm.; of wings, 16 mm.; of hind femora, 10 mm.

Habitat. — ♀ 1, Island of Trinidad, West Indies, H. B. Chipman collector. (Coll. L. Bruner.)

Subfamily ENEOPTERINÆ.

111. *Apithes annulicornis* Saussure.

Apithes annulicornis Sauss., Miss. Scient. Mex., Orthopt., p. 491 (1870).

A single female specimen collected by Chipman on the Island of Trinidad.

112. *Aphonus silens* Saussure?

Aphonus silens Sauss., Melang. Orthopt. Gryll., p. 805 (1878).

I find a single rather large gryllid among the collections obtained by Chipman on the Island of Trinidad which is referred here with some doubt.

In addition to the insects listed and described on the preceding pages there are at least four or five additional forms which I have not yet determined. Two or three belong to the Tettiginæ as referred to on a previous page, another to the Phaneropterinæ and the last to the Gryllidæ. These will be reported upon later in a separate paper.

JOURNAL
OF THE
New York Entomological Society.

EDITED BY HARRISON G. DYAR.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

EDITORIAL.

The April issue of our interesting contemporary, *Entomological News*, contains much matter devoted to our criticism of the work of its editor. We feel a sense of amusement at the editor's efforts to "save his face." We would repeat that until Dr. Skinner produces a better classification of the Hesperiidæ, he must accept the one advanced by us, or abandon all generic names and simply list the species of Skippers in any order that pleases him. The generic names he uses cannot be defended. We notice he has not attempted it. Dr. Skinner persists in crediting the new classification to us. It is original with Scudder and Watson. It was Mabille's imperfect presentation of it, as applied to the American forms, that induced us to attempt the subject. Dr. Skinner makes certain criticisms of the characters used, with which, in part, we agree. It is probable that we are aware of more imperfections in the system than Dr. Skinner is, owing to his lack of critical study of genera. His dogmatic utterances that this species is more nearly related to that, etc., although placed by us in different genera, are not due to actual knowledge. Dr. Skinner knows nothing of the early stages and belittles structure; his assertions are founded solely on his ideas of superficial resemblance. His criticism of the use of secondary sexual characters in generic definition is, perhaps, well made; but everybody uses these convenient characters, except Sir George F. Hampson, and even he uses them for subgenera.

Their use in this case is perfectly sanctioned by custom and the authority of many of the best systematists. It is true that exactly what characters shall be used in generic definition can never be arbitrarily asserted nor established by rule; that will depend upon individual ability and tact. If Dr. Skinner does not like the Scudderian system, let him produce another for comparison with it. No positive advance can be made through wholesale criticism without constructive work.

BOOK NOTICES.

Les Moustiques, Histoire Naturelle et Médicale, Par RAPHAËL BLANCHARD, Professeur à la Faculté de Médecine de Paris, Membre de l'Académie de Médecine. Paris: F. R. de Rudeval, 1905.

The book contains 673 pages in seven chapters and an appendix, including introductory definitions, systematic account of the species, their pathological properties, prophylaxis, methods of collecting and breeding and a list of recently described species (appendix). The general account refers at some length to allied forms, *Simulium*, *Tipula*, *Dixa*, *Chironomus*, etc., with text figures. The Corethridæ are not included as mosquitoes. Theobald's classification is adopted, based as it is largely on unimportant scale characters, although somewhat modified by the introduction in the text of the subfamilies Sabethinæ and Joblotinæ to replace Theobald's nameless sections B and C. This is really a distinct improvement and approximates the classification to that of Lutz, epitomized on page 619. Figures of adults and larvæ are copied from various authors and inserted as text figures. This has resulted in some errors. On page 297 a figure of a larva is given as *confinis* Arrib.; it should be transferred to *jamaicensis* Theob., page 279. Page 403, *Aedes smithii* should be transferred to *Wyeomyia* in the Sabethinæ. Errors of this nature are liable to occur in a compilation, such as Professor Blanchard's work essentially is, and are due to incomplete following up of the subsequent literature. Professor Blanchard is an enthusiastic follower of Theobald, and he has taken advantage of that author's remarkable ability in the creation of homonyms to propose a number of new and beautifully formed generic terms. He has also changed Theobald's badly made names into the proper grammatical forms, which we think he has no right to do. These names will have to stand as first proposed, bad as they are. Fortunately most of them will fall into the synonymy when the scale

characters on which they are founded are relegated to their proper place of subordination. Professor Blanchard's book is really a mine of information about mosquitoes. We only regret that he did not print his own synoptic tables and classification, which were prepared at much pains as he tells us, but thrown in the waste basket on seeing Theobald's book, in an access of enthusiasm, scarcely deserved, we fear. "Les Moustiques" should be in the hands of every student of mosquitoes.

A Monograph of the Anopheles Mosquitoes of India. By S. P. JAMES, M.B., I.M.S., and W. GLEN LISTON, M.D., I.M.S. Calcutta, 1904.

The authors find twenty-four species of *Anopheles* in India, of which they know the larvæ of eighteen. The adults are figured on a green background, which relieves the white scales beautifully and gives a very fine effect. The species should be easily recognized. Ten of the larvæ are figured. The larvæ all differ from the American species in the greater development of the fan-shaped dorsal tufts, which are present on the second abdominal segment in all cases and in many also on the first abdominal and on the metathorax. The larvæ must therefore have even a closer connection with the surface film of the water than is the case with our species. Most of the species have the front of the head triangularly produced and the antennæ much thickened, though some are more rounded like our species. *A. barbirostris* Van der Wulp is nearest in aspect to ours. The species are divided into two groups: first, with the antennal tuft branched (as in our species), containing three species; second, antennæ without branched hair, containing fifteen species. The first group is subdivided by the frontal hairs being simple or branched; the second by the presence or absence of the fan-shaped tuft on the thorax. The details of the frontal hairs and the fan-shaped tufts are used to separate the species. Six types of *Anopheles* eggs are shown (p. 39), which differ remarkably in the development and position of the "floats." This structure is present in all, though in *A. turkhudi* Liston it is reduced to a little dorsal ellipse near one pole of the egg. The authors reject Theobald's genera of the Anophelinæ founded on scale characters (with their reasons for rejection given in detail) and place all the species in *Anopheles*. They nevertheless divide them into ten groups on general affinity, but without any very sharp diagnostic characters.

JOURNAL
OF THE
New York Entomological Society.

Vol. XIV.

DECEMBER, 1906.

No. 4

Class I, HEXAPODA.

Order IV, DIPTERA.

THE LARVÆ OF CULICIDÆ CLASSIFIED AS
INDEPENDENT ORGANISMS.

BY HARRISON G. DYAR AND FREDERICK KNAB.

WASHINGTON, D. C.

(Plates IV-XVI.)

"Wer A sagt muss auch B sagen."—*German proverb.*

We are compelled to the conclusion that specific limits are more sharply defined or at least more readily appreciable, in the larvæ of the Culicidæ, than in the adults, although generic limitations are less closely drawn. In the larvæ we observe many marked modifications in shape and details of the chitinized parts which appear constant for the species and lend themselves readily to definition, while, in the adults, the specific characters, in the females at least, seem largely dependent upon comparatively undefined differences in coloration, which are easily lost or obscured if the specimen is at all injured in emergence or worn by flight. We are further impelled to present the results of our study of the larval forms separately for the following considerations. Dr. L. O. Howard has placed in the hands of the senior author all the larval material collected with the aid of grants from the Carnegie Institution of Washington for a monograph of the

Culicidæ of North and Central America, for classification and description, with the very kind permission to publish descriptions of the new larvæ in advance of the monograph. The adults have been given into other custody, and the determinations that have been transmitted to us are, in many cases, at variance with larval characters. We have been unable to personally examine into the discrepancies without exceeding the field which has been assigned to us. Therefore it seemed advantageous to treat the larvæ as independent organisms and classify them separately, especially as an independent classification, consistently worked out, when compared with the one based on adult characters, should throw light on the phylogeny of the group and indicate the more reliable distinctions. If any apology is due for proposing new names for larval forms, we hereby make the apology. To us, it seems justified in this case, especially as, in nearly all cases, bred adults are in the hands of our co-workers. We find, moreover, that a synonym is easily dealt with, whereas a misidentification or confusion of two species under one name is really more troublesome. Therefore, if it shall prove that we have named the larvæ of previously described species, we believe that less difficulty will be experienced than if we had left them nameless, or doubtfully referred them to known species.

The junior author has made a trip to the West coast of Central America after mosquito larvæ and has been closely associated with the work subsequently as artist for the early stages. We are indebted to Dr. Howard for the opportunity to study the material, as well as the drawings of the mouth parts made by Miss Evelyn G. Mitchell and Miss Mary Carmody for the monograph. We also feel grateful to Dr. Howard's numerous assistants and correspondents, who have helped to collect the material and, especially, to Mr. August Busck and Mr. F. W. Urich, who have obtained so many of the West Indian species.

The identifications of adults here used have been made by Mr. D. W. Coquillett of the Bureau of Entomology, U. S. Department of Agriculture, custodian of Diptera in the U. S. National Museum. We have accepted these determinations wherever there existed no apparent reason to discredit them. We have not personally verified them in any case, as the specimens are not before us.

Family CULICIDÆ.

Definition.

The larvæ of the Culicidæ are characterized by a well-formed head, enclosed in a chitinous covering, with compound eyes, single-jointed antennæ, a vibratile or prehensile group of hairs before the oral orifice, well-developed toothed mandibles with a row of cilia, quadrate or conical hirsute maxillæ and a short single-jointed palpus. The thoracic segments are consolidated into a transversely elliptical flattened mass; the abdomen consists of nine segments slender and submoniliform, the eighth with a dorsal respiratory opening, often prolonged into a chitinous tube, connecting with two tracheæ running the length of the body. The last segment is smaller, is furnished with a chitinous plate and usually with four delicate anal appendages. The body is supplied with setæ in tufts or singly, usually more or less conspicuously feathered. There are generally present certain scales on the sides of the eighth segment and in two rows on the posterior aspect of the air tube.

From the other aquatic Nematoceros Diptera, the Culicidæ are separable by the presence of the mouth brush, the shape of the anal segment and the absence of abdominal feet. The Corethridæ and Dixidæ run very close to the Culicidæ, and seem, indeed, inseparable therefrom on any one character, although different enough in the general complex of characters.

Classification.

Until their very recent sudden rise into economic importance, the Culicidæ have been a much neglected family. Very lately there has arisen great activity in the collection and study of these insects, which has resulted in an extensive work by Mr. F. V. Theobald of Wye, England, based on the large material which has been accumulated at the British Museum. The results have been remodelled by Prof. R. Blanchard of Paris, France, and certain crudities eliminated, the whole now presented to the public in excellent form. The system seems to us unsound from top to bottom. We cannot restrain a feeling of surprise that eminent authors should adopt such weak characters for the separation of subfamilies and genera. Much weight is given to the length of the palpi in the male or female, to which we find two fundamental objections. The length of palpi

is, in our experience, never an important character, in any insects, being adaptive and not of more, often of less than generic value. When a character exists in one sex only, it is of far less importance, belonging to the class of secondary sexual characters, which by some systematists of standing are uniformly denied to be of even generic value. In this case, both these objections, applying together, have added force and appear to us to utterly discredit any system founded on them.

In the definition of genera, much importance is attached to the shape and arrangement of the scales. To any one conversant with the value of different characters in insects, this appears, *a priori*, an unfortunate selection. How it works cannot be better shown than by a quotation from James and Liston*, whose common sense remarks deserve the greatest publicity:

"In the classification of mosquitoes Mr. Theobald relies almost entirely upon scale structure for the distinctions between different genera, and in one case he has used this character alone for the formation of a subfamily.

"The classification is based in great part on the shape, and not upon the presence or absence of scales, and it is a matter of great difficulty to decide in some cases what form of scale predominates; nor does Mr. Theobald give any indication of what portion of a wing, for example, should be examined to decide this point.

"The terms 'lanceolate', 'long and narrow', 'true scales', etc. are not sufficiently definite to permit of such scales being easily distinguished from one another, except perhaps by Mr. Theobald himself. It is obvious that the distinction between 'hair-like curved scales' and 'narrow curved scales' is not great, and also that it would be difficult to decide whether the abdomen is 'hairy' or whether it is covered with 'hair-like scales' which apparently resemble hairs so closely that they cannot be termed 'true scales.' As regards the wing again it would be certainly difficult to decide whether most of the scales were 'lanceolate' or whether they were 'mostly long and narrow' especially as the part of the wing to be examined is not stated, but on this decision alone depends the distinction between the genera *Anopheles* and *Myzomyia*.

*A monograph of the *Anopheles* mosquitoes of India, Calcutta, 1904; pp. 16 and 64.

"One of the objects of classification is to simplify the identification of species, but the new classification does not aid this in any way. In practice, it will be found much easier to determine the specific name of any specimen than its generic name according to the new system.

"Species which differ widely in their habits and pathological significance are placed in the same genus, while those which are similar in these important respects are placed in different genera.

"Species of which the eggs and larvæ, the characters of which are at least as important as the shape of the wing scales in the adult insect, are essentially different are placed in the same genus, while those with eggs and larvæ of the same type are placed in different genera.

"The distinctions between the different genera are not of equal value, for whereas certain species are placed in different genera because in the one case the wing scales are 'lanceolate' while in the other they are 'mostly long and narrow'; the fact that the abdomen of one is densely covered with scales while that of the other is, practically speaking, entirely free from them, is not considered sufficient to warrant these two species being placed in different genera.

"Abnormal forms or monstrosities have been made the basis of new genera and species. During the examination of the types of *Anopheles rossi* deposited in the British Museum, Mr. Theobald encountered a specimen the abdomen of which was covered with scales arranged as in mosquitoes of the genus *Culex*. To us it appears very probable that this is an instance of a monstrosity. Mr. Theobald, however, classifies the insect without question as the type of a new genus (*Aldrichia*). Another instance is the specimen on which Mr. Theobald has founded a new subfamily (*Heptaplebomyina*); the single insect was provided with seven longitudinal veins on its wings instead of only six."

The final test of any system of classification is the degree of its agreement with the phylogeny of the group. The past history is indicated by all the stages, often more clearly in the larvæ than in the adults. We present the following study of the Culicid larvæ in the hope that it may elucidate the subject. The senior author has shown* that adult characters, rightly understood, harmonize beautifully with those of the larvæ in the case of subfamilies. We be-

*Science, n. s., xxiii, 233, 1906. The classification of Dr. Lutz, in C. Bourroul, Mosquitoes do Brasil, Bahia, 1904, approaches this.

lieve that the same relation can be traced to genera and, indeed, have in mind certain adult characters which we think would work out excellently. At present, however, we are restrained by the limitations of our field from applying these ideas.

After writing the above we have seen a recent classification by Mr. Coquillett (Science, n. s., xxiii, 312, 1906) in which one of our characters, the tarsal claws of the female, is used to good effect. Otherwise the arrangement is based too largely on larval characters* to be of value in the present connection. We wish to compare our arrangement, based solely on larval characters with one based solely on adult characters. The only one so available is that of Mr. Theobald, which does not stand the test of that comparison, for the reasons we have discussed.

Table of subfamilies.

Air tube short and sessile; a series of subdorsal palmate hair tufts on the abdomen.....	ANOPHELINÆ
Air tube elongate, at least longer than wide; no dorsal palmate hairs.	
Anal segment with an unpaired ventral brush or rudder of dense hair tufts.....	CULICINÆ
Anal segment without unpaired median ventral brush.....	SABETHINÆ

Subfamily ANOPHELINÆ

Table of genera.

Abdomen with plumose lateral hairs only on the first three segments; head with plumose hairs.....	<i>Anopheles</i>
Abdomen with plumose lateral hairs to the sixth segment; head with small simple hairs only.....	<i>Coelodiazesis</i>

Genus ANOPHELES Meigen.

Anopheles Meigen, Syst. Besch. bek. eur. zweifl., Inst., i, 10, 1818.

Cyclolepteron Theobald, Jn. trop. med., iv 234, 1901.

Cyclolepidopteron Blanchard, Cont. rend. heb. soc. biol., liii, 1045, 1905.

Grassia Theobald (not Fisch), Jn. trop. med., v, 181, 1902.

Myzomyia Blanchard, Cont. rend. heb. soc. biol., liv, 795, 1902.

Stethomyia Theobald, Jn. trop. med., v, 181, 1902.

Howardia Theobald (not Dalla Torre), Jn. trop. med., v, 181, 1902

Pyrethophorus Blanchard, Cont. rend. heb. soc. biol., liv, 795, 1902.

*Miss Mitchell's generalization, adopted by Mr. Coquillett, about the egg-laying habits is fallacious, and will not hold. This might have been anticipated as it is clearly an adaptive character.

- Rossia* Theobald (not Bonaparte, not Owen), Jn. trop. med., v, 181, 1902.
Myzorhynchus Blanchard, Cont. rend. heb. soc. biol., liv, 795, 1902.
Laverania Theobald (not Grassi and Feletti), Jn. trop. med., v, 181, 1902.
Nyszorhynchus Blanchard, Cont. rend. heb. soc. biol., liv, 795, 1902.
Cellia Theobald, Mon. Culic., iii, 107, 1903.
Arribalzaga Theobald, Mon. Culic., iii, 81, 1903.
Aldrichia Theobald, Mon. Culic., iii, 353, 1903.
Christya Theobald in Giles, Rev. Anoph., suppl. i, Handb., Gn. or Mosq., 2 ed. 40, 1904.
Lophomyia Theobald in Giles, Rev. Anoph., suppl. i, Handb. Gnats or Mosq., 2 ed., 366, 1904.

Table of species.

1. A pair of palmate hairs on the second abdominal segment (2d to 7th)... 2
 No palmate hairs on the second abdominal (3d to 7th)..... 4
2. Comb of the eighth segment with the teeth coarsely serrate below... *albipes*
 Comb teeth finely and inconspicuously serrate..... 3
3. Comb with the two upper long teeth with a short tooth between; three lower teeth with five between..... *argyrotarsis*
 Comb with the two upper teeth with none between; three lower with four between..... *albimana*
4. Comb with seven long teeth regularly alternating with six short ones
mediopunctatus
 Comb with short teeth irregularly alternating..... 5
5. Comb with the four upper teeth short..... *maculipes*
 Comb with some of the upper teeth long, at least the first or third..... 6
6. One long lower tooth, followed by four little ones..... *franciscanus*
 One long lower tooth, followed by three little ones..... *punctipennis*
 Lower long tooth followed by another as long or nearly so..... 7
7. Upper tooth short..... 8
 Upper tooth long..... 9
8. Two long lower teeth followed by two short, one long, three short ones
grabhamii
 Two long lower teeth followed by three short, one long, four short ones
maculipennis
9. The three upper teeth long..... *eiseni*
 The second upper tooth short..... 10
10. One short tooth between the two upper long ones..... *crucians*
 Three short teeth between the two upper long ones... *pseudopunctipennis*

Anopheles albipes Theobald.

- Anopheles argyrotarsis albipes* Theobald, Mon. Culic., i, 125, 1901.
Nyszorhynchus cubensis Blanchard, Les Moustiques, 204, 1905.

Recorded from South America and the West Indies. Our specimens are from Port Limon, Costa Rica.

Anopheles argyrotarsis Desvoidy.

Anopheles argyrotarsis Desvoidy, Mem. soc. d'hist. nat. Paris, iii, 411, 1827.
Nyssorhynchus albimanus Blanchard (in part), Les Moustiques, 202, 1905.

Blanchard makes this a synonym of *albimanus*. The names have been given us separately and the larvæ differ. Our specimens are from Rincon Antonio, Oaxaca, Mexico.

Anopheles albimanus Wiedemann.

Anopheles albimanus Wiedemann Dipt. exot., 10, 1821.
Nyssorhynchus albimanus Blanchard, Les Moustiques, 202, 1905.

Recorded from South America and the West Indies. We have it from Trinidad, Martinique and St. Domingo (Busck).

Anopheles mediopunctatus Theobald.

Cyclolepteron mediopunctatus Theobald, Mon. Culic., iii, 60, 1903.

Described from Brazil. The junior author obtained a specimen in Cordoba, Mexico, which has been so named.

Anopheles maculipes Theobald.

Arribalzagia maculipes Theobald, Mon. Culic., iii, 81, 1903.

Described from Brazil and Trinidad. Our specimens are from Trinidad (Urich), one of the type localities.

Anopheles franciscanus MacCracken.

Anopheles franciscanus MacCracken, Ent. news, xv, 12, 1904.

Described from California. We have specimens from Salina Cruz and Cordoba, Mexico, as well as Miss MacCracken's material.

Anopheles punctipennis Say.

Culex punctipennis Say, Journ. acad. nat. soc. Phil., iii, 9, 1823.

Anopheles punctipennis Blanchard, Les Moustiques, 167, 1905.

The commonest species in the Atlantic Coast region and Mississippi Valley, much commoner than *maculipennis*.

Anopheles grabhamii Theobald.

Anopheles grabhamii Theobald, Mon. Culic., i, 205, 1901.

Cyclolepidopteron grabhamii Blanchard, Les Moustiques, 185, 1905.

Described from Jamaica. Our specimens are from St. Domingo (Busck).

Anopheles maculipennis Meigen.

Anopheles maculipennis Meigen, Klass. Besch. eur. zweifl. Ins., i, 5, 1804.

Anopheles maculipennis Blanchard, Les Moustiques, 160, 1905.

Received from various parts of the United States. Occurs also in Europe.

Anopheles eiseni Coquillett.

Anopheles eiseni Coquillett, Journ. N. Y. ent. soc., x, 192, 1902.

Described from Guatemala. We have it from Cordoba, Mexico.

Anopheles crucians Wiedemann.

Anopheles crucians Wiedemann, Ausser. Zweifl. Ins., i, 12, 1828.

Anopheles crucians Blanchard, Les Moustiques, 171, 1905.

Occurs in the southern Atlantic States from New York to Florida.

Anopheles pseudopunctipennis Theobald.

Anopheles pseudopunctipennis Theobald, Mon. Culic., ii, 305, 1901.

Described from New Grenada, Lesser Antilles. Our specimens are from Acapulco and Salina Cruz, Mexico. We assume them to be correctly named, although the localities are rather remote.

Genus COELODIAZESIS, new.

Differs from *Anopheles* in the slight development of the head hairs, the presence of plumose hairs after the third abdominal segment, and the absence of short teeth on the comb of the eighth segment. Type, *C. barberi* Coq.

Coelodiazesis barberi Coquillett.

Anopheles barberi Coquillett, Can. ent., xxxv, 310, 1903.

Anopheles barberi Dyar, Journ. N. Y. ent. soc., xii, 243, 1904.

The larvæ live in the water in hollow trees. This habit is unique among the Anophelinae, which are in general surface feeders in open water. As a compensation for the restricted surface offered in their habitat, the larvæ have acquired a predaceous habit and devour the unfortunate larvæ of *Aedes triseriatus* and *Mansonia signifer* with which they live.

Subfamily CULICINÆ.

Table of genera.

1. Mouth brush prehensile, folded outward in a pencil..... 2
Mouth brush vibratile, diffusely folded inward 4
2. A lateral plate on the eighth abdominal segment..... *Megarhinus*
A lateral patch of scales on the eighth abdominal segment..... 3
3. Scales of the 8th segment in a line preceded by a patch of minute ones.
Psorophora
Scales alike, in a triangular patch without small ones..... *Lutzia*
4. Air tube long, the hairs in scattered tufts or absent, the antennæ
usually with the tuft beyond the middle arising from a notch..... 5
Air tube short, less than four times as long as wide, or if longer
the antennæ with the tuft at or before the middle..... 7
5. Anal segment without hairs before the barred area 6
Anal segment with hairs along ventral line, piercing the chitinous band
Culicella
6. Lateral comb of the 8th segment of many scales in a triangular patch *Culex*
Lateral comb of the 8th segment a single row of bar-like spines *Mochlostyrax*
7. Air tube strongly inflated..... *Janthinosoma*
Air tube not conspicuously inflated..... 8
8. Antennæ strongly inflated and distorted *Ceratocystia*
Antennæ not so 9
9. Head normal, without lateral angular projection..... 10
Head with lateral projection covering a process on the mandible.....
Deinocerites
10. Head with large thick spinous setæ..... *Uranotania*
Head with normal fine hairs..... 11
11. Seventh abdominal segment with a dorsal plate; tube without pecten
Mansonia
Abdomen without plates; air tube with pecten..... 12
12. Air tube conical or tapered, normal..... 13
Air tube bottle-shaped, the outer half narrow *Tæniorhynchus*
13. Air tube pecten produced into long hairs..... *Culicseta*
Air tube with the pecten not so produced *Aedes*

Genus MEGARHINUS Desvoidy.

Megarhinus Desvoidy, Mem. soc. d'hist. nat. Paris, iii, 412, 1827.

Megarhinus Blanchard, Les Moustiques, 220, 1905.

Table of species.

1. Large species, the chitinated parts very dark..... *portoricensis*
Smaller species, the chitinated parts very pale..... *violaceus*

Megarhinus portoricensis von Roder.

Megarhina portoricensis von Röder, Stett. ent. Zeit., xlv, 337, 1885.

Megarhinus rutila Coquillett, Can. ent., xxviii, 44, 1896.

We are unable to distinguish the larvæ of *portoricensis* and *rutila*, which occur together, and conclude that there is but one species, the degree of white banding on the tarsi of the adults being probably variable. The larvæ inhabit hollow trees and similar artificial situations. They are exclusively carnivorous in their diet, devouring the larvæ of the other Culicinæ with which they live. Mr. Busck has noted that they kill all the larvæ that are with them before pupation. We have the species from the southern Atlantic States, West Indies and Central America. A specimen from Guadeloupe (Busck) was named "*M. violaceus*," but the adult was in poor condition.

***Megarhinus violaceus* Wiedemann.**

Culex violaceus Wiedemann, Dipt. exot., i, 7, 1821.

We accept this determination with some hesitation for some very pale colored larvæ of normal structure taken from the leaves of Bromelias by Mr. Urich in Trinidad. The species was described from Bahia (Brazil), but is insufficiently known, as stated by Blanchard. We would note that Dr. Lutz has recently described two *Megarhinus* bred from Bromelia water, one in Bahia, the other in Rio Janeiro. We are surprised that there should be several species with this limited habitat, and suspect the possibility of variability in the adults, as in the foregoing species.

Genus PSOROPHORA Desvoidy.

Psorophora Desvoidy, Mem. soc. d'hist. nat. Paris, iii, 412, 1827.

Psorophora Blanchard, Les Moustiques, 237, 1905.

Table of species.

1. Air tube less than three times as long as wide; a single tuft almost at tip
cilipes
- Air tube four times as long as wide; a single hair shortly beyond the pecten.....²
2. Labial plate with the teeth regular and subequal.....*ciliata*
- Labial plate with the next to basal tooth greatly enlarged.....*howardii*

***Psorophora cilipes* Fabricius.**

Culex cilipes Fabricius, Syst. Antliat., 34, 1805.

Culex cilipes Blanchard, Les Moustiques, 373, 1905.

We have accepted this identification for some very distinct larvæ taken by the junior author in Puntarenas, Costa Rica. Blanchard

includes the name in his list of uncertain or indeterminable species, but Coquillett is apparently able to recognize it. The larvæ occurred in a temporary pool full of vegetation, together with many Culicid larvæ on which they were feeding.

***Psorophora ciliata* Fabricius.**

Culex ciliatus Fabricius, Ent. Syst., iv, 401, 1794.

Culex molestus Wiedemann, Dipt. exot., i, 36, 1821.

Psorophora boscai Desvoidy, Mem. soc. d'hist. nat. Paris, iii, 413, 1827.

Culex conterrens Walker, Ins. Saund., Dipt., i, 427, 1856.

Culex perterrens Walker, Ins. Saund., Dipt., i, 431, 1856.

Psorophora ciliata Blanchard, Les Moustiques, 239, 1905.

The species occurs in the Atlantic seaboard as far North as Massachusetts, and is common locally at Baltimore and Washington. The larva occurs in temporary rain puddles, hatching immediately after a shower. It is predaceous and very voracious. The principal prey are the species of *Janthinosoma*.

***Psorophora howardii* Coquillett.**

Psorophora howardii Coquillett, Can. ent., xxxiii, 258, 1901.

Occurs on the Atlantic and Gulf coasts, but does not extend its range so far to the North as *ciliata*. The habits are the same and the two species occur mixed in the same puddles. The larvæ are very similar. In Mexico, the junior author found *howardii* considerably more abundant than *ciliata*, while in Central America *howardii* occurred alone.

Genus LUTZIA Theobald.

Lutzia Theobald, Mon. Culic., iii, 155, 1903.

***Lutzia bigotii* Bellardi.**

Culex bigotii Bellardi, Mem. d. R. accad. di Torino, xxi, 200, 1864.

Culex bigotii Blanchard, Les Moustiques, 275, 1905.

Lutzia bigotii Blanchard, Les Moustiques, 394, 1905.

This interesting larva has the predaceous-habits of *Psorophora* and in the main agrees structurally therewith; but in the less degree of modification of the maxillæ, lateral comb of the eighth segment and pecten of the tube, retains more of the structural characters of the other Culicid genera. The junior author collected it at Cordoba,

Mexico, and it has been sent us from Las Cascadas in the Panama Canal zone by Dr. J. A. LePrince.

Genus JANTHINOSOMA Arribalzaga.

Janthinosoma Arribalzaga, Rev. del Mus. de La Plata, ii, 152, 1891.

Conchyliastes Coquillett in Howard, Mosquitoes, 234, 1901.

Feltidia Dyar, Proc. ent. soc. Wash., vii, 47, 1905.

Janthinosoma Blanchard, Les Moustiques, 231, 1905.

Table of species.

1. Antennæ long and prominent, longer than the head 2
Antennæ moderate or short, shorter than the head 5
2. Anal segment long and slender, longer than wide 3
Anal segment short, shorter than wide 4
3. Comb of the eighth segment of six or seven subequal spines *sayi*
Comb of five spines, the upper and lower ones small *varipes*
4. Pecten teeth of the air tube with four long sharp spines *infine*
Pecten teeth of the air tube with two reduced rounded branches. *scholasticus*
5. Tube fusiform-inflated; teeth of comb joined by a chitinous band 6
Tube barrel-shaped; teeth of comb separate *pygmæa*
6. Antennæ black on outer half; four spines of tube pecten scattered to the basal half of the tube *jamaicensis*
Antennæ all white; the four spines of the tube pecten restricted to the basal third of the tube *signipennis*

Janthinosoma sayi, new name.

Culex musicus Say (not Leach), Proc. acad. nat. sci. Phil., vi, 149, 1827.

Janthinosoma mexicana Blanchard, Les Moustiques, 234, 1905.

The larva is found in temporary rain puddles and develops rapidly, as do all of this genus. It occurs along the Atlantic seaboard as far North as Massachusetts, but is common only further South. The senior author met with it in abundance at Tampa, Florida. The junior author collected it at Santa Lucrecia, Almoloya and Tehuantepec, Mexico; Sonsonate, Salvador; Corinto, Nicaragua; Puntarenas and Port Limon, Costa Rica. Blanchard says that *musicus* Say (preoccupied) is surely the same as *mexicanus* Bellardi; but Coquillett has identified as *mexicana* another species, which he refers to "*Culex*" as it differs in scale structure. We therefore propose the new name *sayi* for our familiar species.

Janthinosoma varipes Coquillett.

Conchyliastes varipes Coquillett, Can. ent., xxxvi., 10, 1904.

Janthinosoma varipes Blanchard, Les Moustiques, 626, 1905.

Described from Mexico and Mississippi. Our larvæ are from Baton Rouge, Louisiana, from Dr. Dupree.

Janthinosoma infine, new species. Fig. 1.

The characters are normal for the genus. The antennæ are greatly developed, the anal segment short, the scales of the lateral comb of the eighth segment are joined by a very weak chitinous band; the single scale has its apical spinule long. The larvæ were collected by Mr. Busck in Trinidad and St. Domingo in rain water pools and ditches, in a spring in a cave, in a slowly running spring, in a pot-hole in coral rock in the woods, in a pot-hole near the coast with rather salt water and in holes made by wild pigs in the San Francisco Mts. of St. Domingo. The specimens have been named '*Culex confinis*,' but *confinis* was described by Arribalzaga from the Argentine and is referred by Blanchard to *Tæniorhynchus*; so we do not accept the identification.

Janthinosoma scholasticus Theobald. Fig. 2.

Culex scholasticus Theobald, Mon. Culic., ii, 120, 1901.

Culex scholasticus Blanchard, Les Moustiques, 336, 1905.

Described from the Antilles. Our specimens are from Trinidad, taken by Mr. Busck in rain water pools at Cedros, with the preceding species. We have accepted this identification, although it is perhaps open to some doubt, as Mr. Coquillett later applied this same name (*scholasticus*) to a very different species, collected by the junior author in Central America, which same species he had also named "*secutor* Theob." Not, however, the true *secutor* Theob. of Jamaica, of which we have specimens from Dr. Graham. (See *Culex lactator* and *C. coronator* described below).

Janthinosoma pygmaea Theobald. Fig. 3.

Grabhamia pygmaea Theobald, Mon. Culic., iii, 245, 1903.

Described from Antigua and Jamaica. Our specimens were taken by Mr. Busck in St. Domingo in pools in coral rock close to the sea, filled with clear salt water, only submerged by the highest tides. We have accepted the determination because we do not know but that Theobald's specimens came from larvæ with the same peculiar habits as ours; this is not stated, and we give the matter the benefit of the doubt.

Janthinosoma jamaicensis Theobald.

Culex jamaicensis Theobald, Mon. Culic., i, 345, 1901.

Grabhamia jamaicensis Theobald, Mon. Culic., iii, 244, 1903.

Culex jamaicensis Blanchard, Les Moustiques, 279, 1905.

Grabhamia jamaicensis Blanchard, Les Moustiques, 397, 1905.

Recorded from Jamaica only. We have before us a widespread species, common along the Atlantic seaboard, taken by Mr. Busck on St. Domingo and by the junior author in Santa Lucrecia, Rincon Antonio, Tehuantepec, Salina Cruz and Almoloya, Mexico. It was formerly named "*perturbans* Walk." by Mr. Coquillett, then changed to "*confinis* Arrib." under which name a figure of the larva was published by the senior author (see Blanchard, Les Moustiques, p. 297), and lastly named *jamaicensis* Theob. We accept this name, although lacking the positive identification of larvæ from Jamaica.

Janthinosoma signipennis Coquillett.

Tæniorhynchus signipennis Coquillett, Proc. ent. soc. Wash., vi, 167, 1904.

Tæniorhynchus signipennis Dyar, Journ. N. Y. ent. soc., xii, 244, 1904.

Described from Monterey, Mexico. Our larvæ are from Laredo, Texas, bred by Dr. Berry.

Genus *CERATOCYSTIA*, new.

Characterized by the greatly enlarged, bent antennæ, which have two of the apical spines far removed from the tip. The larva is allied to *Janthinosoma*, except that the tube is not inflated. This is apparently compensated for by the enlargement of the antennæ. Type, *C. discolor* Coq.

Ceratocystia discolor Coquillett.

Culex discolor Coquillett, Can. ent., xxxv, 256, 1903.

Culex discolor Smith, Ent. news, xv, 147, 1904.

Culex discolor Dyar, Journ. N. Y. ent. soc., xii, 173, 1904.

Culex discolor Felt, Bull. 79, N. Y. Sta. Mus., 297, 1904.

Culex discolor Smith, Agr. Exp. Sta. N. J., Rept. Mosq., 193, 1905.

Described from New Jersey. The species occurs sparingly along the Atlantic seaboard and has been taken by the junior author at Tehuantepec, Mexico. The larvæ occur in temporary rain puddles in company with *Janthinosoma* and *Psorophora*. The eggs are spinose, as in those genera. All these spinose eggs seem adapted to lie in dried ground and hatch immediately after a shower. The development of the larva is rapid.

Genus *TÆNIORHYNCHUS* Arribalzaga.

Tæniorhynchus Arribalzaga, Rev. del Mus. de La Plata, ii, 147, 1891.

Coquillettidia Dyar, Proc. ent. soc. Wash., vii, 47, 1905.

Tæniorhynchus Blanchard, Les Moustiques, 381, 1905.

Tæniorhynchus perturbans Walker.

Culex perturbans Walker, Ins. Saund., i, 428, 1856.

Culex perturbans Dyar & Currie, Proc. ent. soc. Wash., vi, 218, 1904.

Tæniorhynchus perturbans Blanchard, Les Moustiques, 386, 1905.

The mature larva is undiscovered and its habits remain a mystery. Several excellent collectors searched for it in vain. Professor J. B. Smith had masses of *Spirogyra* examined, but without result, as he tells us. The young larva obtained from eggs has been described, but failed to feed. The peculiarities of habit, whatever they may be, which have rendered this species undiscoverable are evidently common to the other members of the genus, for Professor Goeldi in Brazil (Os Mosq. no Para, 107, 1905) has exactly repeated our experience with *T. fasciolatus* Arrib. and *T. arribalzagæ* Theob., and his first stage larvæ agree structurally with ours. The antennæ are excessively long and the air tube is roundedly narrowed at the middle, the distal half being slender and resembles a thick spine. The tip is armed with hooks.

Genus *MANSONIA* Blanchard.

Panophiles Theobald (not Gould), Journ. Trop. Med., iv, 229, 1901.

Mansonia Blanchard, Cont. rend. heb. Soc. Biol., liii, 1045, 1901.

Pneumaculex Dyar, Proc. ent. soc. Wash., vii, 46, 1905.

Tæniorhynchus Dyar (not Arribalzaga), Proc. ent. soc. Wash., vii, 47, 1905.

We are unaquainted with the larva of the typical species of *Mansonia* (*titillans* Walk.) and if it should prove to be different in structure,* the name *Pneumaculex* is available for the forms here associated. The senior author has shown that the genus should be called *Tæniorhynchus* if the rule of first species be accepted in determining the type.

Table of species.

1. Plate on the sixth abdominal segment a dorsal saddle; no plate on the eighth segment below the comb..... *signifer*

*We are almost certain that this will prove to be the case. Goeldi figures the eggs of *titillans* (Os Mosq. no Para. 114, 1905), which have nothing in common with those of the species here treated, but are of the type of an *Aedes*.

Plate on the sixth segment reaching to the middle of the side; a plate on the eighth segment below the comb*fascipes*

Mansonia signifer Coquillett.

Culex signifer Coquillett, Can. ent., xxviii, 43, 1896.

Stegomyia signifer Theobald, Mon. Culic., i, 322, 1901.

Culex signifer Smith, Ent. news, xi, 26, 1903.

Culex signifer Dyar, Journ. N. Y. ent. soc., xi, 26, 1903.

Culex signifer Smith, N. J. Agr. exp. Sta., Bull. 79., 338, 1904.

Stegomyia signifer Blanchard, Les Moustiques, 258, 1905.

Culex ? signifer Ludlow, Med. Record, N.Y., Jan. 20, 1906.

The larva is a normal inhabitant of the water in hollow trees. It occurs also in similar artificial situations, such as rain barrels, and is rather widely distributed in the United States. The peculiar dorsal platings on the abdomen appear only in the last stage, but the larva is recognizable in all stages by the absence of pecten on the air tube. The tracheal tubes are expanded into bladders in the thorax. The eggs are deposited at the water line and adhere firmly to the side of the vessel. They are covered by a peculiar veil, marked by radial folds.

Mansonia fascipes Coquillett.

Mansonia fascipes Coquillett. Proc. ent. soc. Wash., vii, 182, 1906.

We have received these peculiar larvæ from Mr. F. W. Urich from Trinidad, who communicates the following notes. "The predominating colour of these larvæ is red; when young the pigment is pale on the dorsal anterior half of each segment of thorax and abdomen and gets lighter, until a white ring is formed at the joint with the next segment, thus giving the larva a red and white ringed appearance. This coloration is maintained right through all stages of the larva. At each change of skin the red color gets more intense, until the mature larva has a rather dark appearance. The pupa also has a reddish tint showing through the brown coloration. The larvæ live in bamboo joints, the water in which teems with infusoria, small worms and other micro-organisms. It would appear as if this fauna is essential to their well-being, for if isolated too young they die or do not mature well. The larval period seems to take a long time." Mr. F. C. Pratt has observed a similar red coloration in the larvæ of *signifer*, but we had heretofore attributed to it a pathological significance. Probably it is normal to the genus.

Genus URANOTAENIA Arribalzaga.

Uranotaenia Arribalzaga, Rev. del Mus. de La Plata, ii, 163, 1891.

Uranotaenia Blanchard, Les Moustiques, 406, 1905.

Uranotaenia Mitchell, Journ. N. Y. ent. soc., xiv, 8, 1906.

Our species are in a very unsatisfactory state, but the paucity of our present material does not enable us to remedy it. Miss Mitchell has given a table of the species identified from the United States and Dr. Grabham figures the two Jamaican species. We have another from Mr. Urich in Trinidad and the junior author collected one in Mexico. The following table, as compiled, appears to show that the continental forms identified as *socialis* and *lowii* are not conspecific with the insular forms, and we have no recourse but to rename them, although we would much prefer to have good material for actual comparison.

Table of species.

1. Antennæ without spines; longest terminal seta as long as antenna.....
geometrica
- Antennæ with scattered spines; longest terminal seta shorter than antenna. . 2
2. Terminal setæ three, the short one obsolete..... 3
- Terminal setæ four..... 4
3. Shaft rather numerously spined; terminal digit simple..... *lowii*
- Shaft with but two spines; terminal digit double..... *coatzacoalcos*
4. Antennæ with the hair beyond the basal third..... *continentalis*
- Antennæ with the hair at about the basal third..... 5
5. Pedicellate digit double, the two forks about equal in length..... 6
- This digit large and single, the second digit small and arising below the apex of the pedicel..... *sapphirina*
6. Shortest spine a lanceolate blade; apical tooth of labial plate broad and flat..... *socialis*
- Shortest spine slender, filiform; apical tooth of labial plate triangularly pointed..... *coquilletti*

Uranotaenia lowii Theobald.

Uranotaenia lowii Theobald, Mon. Culic., ii, 339, 1901.

Uranotaenia lowii Grabham, Can. ent., xxxvii, 401, 1905.

Described from Santa Lucia. We accept Dr. Grabham's definition of Jamaican specimens rather than Mr. Coquillett's determination of those from Louisiana.

Uranotaenia coatzacoalcos, new species.

The antennæ are stout with a single stout hair at basal third and two short spines on the other side; at tip two long hairs, not as long

as the antennæ, a short one and a sharp angle; a long double blade-like digit that appears to be divided to the base, one part dark and about two-thirds as long as the longer pale portion.

The larvæ were collected by the junior author at Santa Lucrecia, Mexico, in the valley of the river Coatzacoalcos. They were not bred. The larvæ occurred in a ditch full of vegetation.

Uranotænia continentalis, new species.

Sent to Miss Mitchell by Dr. Dupree from Baton Rouge, Louisiana, and identified as "*Uranotænia lowii* Theob." The characters are indicated in the table.

Uranotænia sapphirina Osten-Sacken.

Aedes sapphirinus Osten-Sacken, Trans. Am. ent. soc., ii, 47, 1868.

Uranotænia sapphirina Blanchard, Les Moustiques, 407, 1905.

Not uncommon in permanent swamps or ponds. We have it from New Hampshire and New York. The larva looks like an *Anopheles* with a long tube, owing to its position in the water and shape of the head.

Uranotænia geometrica Theobald.

Uranotænia geometrica Theobald, Mon. Culic., ii, 247, 1901.

Described from Santos, Brazil. Our specimens are from Mr. F. W. Urich in Trinidad, who collected them in a small puddle in a drain. The water was covered with green algæ. Mr. Urich says that the larvæ reminded him at first sight of *Anopheles albipes*. They were colored green, from algæ, no doubt. We have accepted the determination rather because we have no means of disproving it, than that we feel any confidence in its accuracy.

Uranotænia socialis Theobald.

Uranotænia socialis Theobald, Mon. Culic., ii, 340, 1901.

Uranotænia socialis Grabham, Can. ent., xxxvii, 403, 1905.

Described from Jamaica. Dr. Grabham has made known the larva with a description and figure.

Uranotænia coquilletti, new species.

Near *socialis* Theob., but differentiated by the characters given in the table. Dr. Dupree sent the specimens to Miss Mitchell and Mr.

Coquillett named them "*Uranotaenia socialis* Theob." We dedicate the species to Mr. Coquillett, who has certainly performed a vast amount of labor on a difficult subject, whatever we may think of his results.

Genus DEINOCERITIES Theobald.

- Deinocerites* Theobald, Mon. Culic., ii, 215, 1901.
Brachiosoma Theobald, Journ. Trop. med., iv, 229, 1901.
Brachiomysia Theobald, Mon. Culic., ii, 343, 1901.
Deinokerides Giles, Handb. Gn. or Mosq., 472, 1902.
Dinocerites Blanchard, Les Moustiques 413, 1905.

Deinocerites cancer Theobald.

- Deinocerites cancer* Theobald, Mon. Culic., ii, 215, 1901.
Deinocerites cancer Theobald, Mon. Culic., iii, 279, 1903.
Deinocerites cancer Dyar, Journ. N. Y. ent. soc., xiii, 27, 1904.
Dinocerites cancer Blanchard, Les Moustiques, 414, 1905.

The now well-known inhabitant of crab holes at high water mark along the sea shore of southern Florida and the Antilles. We have specimens from Dr. Grabham from Jamaica and it was collected in southern Florida by the senior author and Mr. Caudell. Descriptions have been published.

Genus AEDES Meigen.

- Aedes* Meigen, Syst. beschr. bek. eur. Zweifl. Ins., i, 13, 1818.
Ochlerotatus Arribalzaga, Rev. del Mus. de La Plata, ii, 146, 1891.
Hæmagogus *Williston, Trans. ent. soc. Lond., 271, 1896.
Stegomyia Theobald, Mem. Liverp. Sch. Trop. Med., iv, App., iii, 1901.
Grabhamia Theobald, Mon. Culic., iii, 243, 1903.
Howardina Theobald, Mon. Culic., iii, 287, 1903.
Verrallina Theobald, Mon. Culic., iii, 295, 1903.
Culicelsa Felt, Bull. 79, N. Y. Sta. Mus., 391 b, 1904.
Culicada Felt, Bull. 79, N. Y. Sta. Mus., 391 b, 1904.
Ecculex Felt, Bull. 79, N. Y. Sta. Mus., 391 c, 1904.
Protoculex Felt, Bull. 79, N. Y. Sta. Mus., 391 d, 1904.
Pseudoculex Dyar, Proc. ent. soc. Wash., vii, 47, 1905.
Gymnometopa Coquillett, Proc. ent. soc. Wash., vii, 183, 1906.
Lepidoplatys Coquillett, Science, n. s., xxiii, 314, 1906.

*The genus *Hæmagogus* may perhaps be recognized on the larval character of a small triangular chitinous plate on each side of the ventral brush of the last segment, the segment being not ringed. If so, it will take *Howardina* and *Gymnometopa* as synonyms, and include the species *cyaneus* Fab., *philosophicus* D. & K., *walkeri* Theob., *albonotata* Coq., *buschii* Coq. and *mediorivittata* Coq.

In this group the antennæ are moderate or small; the tuft is always at or before the middle; the air tube is short, three times as long as wide or less and carries a single tuft beyond the pecten. A few species vary in having a more elongate tube and one has multiple tufts. The anal segment is generally not encircled by the chitinous plate, but this occurs in some species.

Table of species.

1.	Air tube with the hair tuft within the pecten	2
	Air tube with the tuft beyond the pecten	8
2.	Anal segment ringed by the plate.....	3
	Anal segment with the ring broken on the ventral line	6
3.	Lateral comb of the eighth segment of few scales in a row....	<i>tormentor</i>
	Lateral comb of the eighth segment many scales in a triangular patch....	4
4.	Pecten of the air tube with detached teeth outwardly.....	<i>bimaculatus</i>
	Pecten of the air tube with the teeth evenly spaced.....	5
5.	Ring of the anal segment narrow; pecten of tube not to the middle...	<i>janitor</i> *
	Ring of anal segment broad; pecten beyond middle.....	<i>lactator</i> *
6.	Comb of few spines in an irregular row; tube with several tufts <i>trichurus</i>	
	Comb of long spines in a straight row; pecten running to apex. <i>walkeri</i>	
	Comb a patch of scales; tube with one hair tuft	7
7.	Pecten with detached teeth; abdominal hairs normal.....	<i>atropalpus</i>
	Pecten evenly spaced; short abdominal hairs stellate.....	<i>busckii</i>
8.	Pecten of the air tube with detached teeth outwardly.....	9
	Pecten of the air tube with evenly spaced teeth.....	13
9.	Air tube 4 x 1; comb a patch of scales three rows deep.....	<i>abfitchii</i>
	Tube 3 x 1 or less; comb of few scales in an irregularly double row....	10
10.	Antennæ enlarged basally, large, tuft rather beyond the middle <i>aurifer</i>	
	Antennæ moderate only; tuft before the middle.....	11
11.	The two rows of pecten on the tube approximate behind dorsal plate of anal segment a saddle only.....	<i>impiger</i>
	Two rows of pecten well separated; dorsal plate over half encircling the segment.....	12
12.	Tuft of tube before outer third; anal processes blunt.....	<i>sylvestris</i>
	Tuft of tube beyond outer third; anal processes pointed.....	<i>fuscus</i>
13.	Comb scales few, in a single or irregularly single row.....	14
	Comb scales more numerous to many in a patch.....	20
14.	Anal segment ringed by the plate.....	15
	Anal segment not ringed, at least a small space along ventral line.....	18
15.	Anal processes moderate, normal.....	16
	Anal processes very long with a stout wavy central trachea.....	<i>dupreei</i>
16.	Comb of six scales; pecten not reaching half of tube.....	17
	Comb of 12 scales; pecten reaching half of tube.....	<i>meridionalis</i>

*Treated under *Culex*, q. v.

17. Pecten of air tube running about one-third; anal segment wider than long..... *punctor*
Pecten of air tube running about one-half; anal segment longer than wide. *atlanticus*
18. Comb scales smooth or nearly so, bluntly rounded 19
Comb scales sole-shaped with trifid apex 20
Comb scales long, pointed, thorn-shaped *philosophicus*
19. Short abdominal hairs normal; anal plate smooth *triseriatus*
Short abdominal hairs stellate; anal plate spined behind.... *albonotata*
20. Air tube pecten small, in a straight row..... *calopus*
Air tube pecten long, strongly spiral..... *mediovittata*
21. Anal segment ringed by the plate..... 22
Anal segment not ringed by the plate..... 31
22. Air tube over twice as long as wide, its pecten of 19-22 teeth..... 23
Air tube twice as long as wide or less, pecten of 12-14 teeth..... 26
23. Scales of comb with central spine shorter than the body of the scale; pecten of the air tube of equal teeth..... 24
Scales of comb with central spine as long as body of scale; pecten of air tube longer outwardly..... 25
24. Air tube two-and-a-half times as long as wide; comb scales moderate, thorn-shaped..... *sollicilians*
Air tube 3 x 1; comb scales long thorn-shaped..... *mitchellæ*
25. Air tube pecten to beyond middle of tube; comb of 21 scales in nearly three rows..... *trivittatus*
Pecten not to middle of tube; comb of 17 scales in two imperfect rows *auroides*
26. Scales of comb feathered on the sides with central thorn; pecten reaching half the length of tube; body glabrous..... *infirmatus*
Scales of comb evenly spinulated without central thorn..... 27
27. Body glabrous..... *inconspicuus*
Body pilose..... 28
28. Pecten to four-fifths of tube; tuft almost apical..... *hemisurus*
Pecten scarcely over half of tube; tuft normal..... 29
29. Lateral hairs single on third to fifth abdominal segments..... *euplocamus*
Lateral hairs double or in threes on these segments..... 30
30. Anal segment short with narrow chitinous ring..... *damnosus*
Anal segment moderate with broad ring..... *habanicus*
31. Tube long, 4 x 1; tracheæ narrow, angled..... *jüchii*
Tube three times as long as wide or less..... 32
32. Anal plate small, not covering more than half of the segment; anal gills very large, sac-like, spotted..... *varipalpus*
Anal plate covering more than half the segment; anal gills moderate.... 33
33. Comb scales tapered, a single median spine stouter or longer, differentiated from the rest..... 34
Comb scales bluntly ended, the median spine resembling the others.... 40
34. Both median head tufts multiple..... 35
Lower head tuft single or double (rarely three)..... 37

- | | | |
|-----|---|---------------------------------------|
| 35. | Subdorsal prothoracic hairs single..... | <i>canadensis</i>
<i>nivitaris</i> |
| | Subdorsal prothoracic hairs multiple..... | 36 |
| 36. | Weakly colored; tufts of ventral brush short-stemmed..... | <i>cantator</i> |
| | Darkly colored; tufts of ventral brush long stemmed..... | <i>pullatus</i> |
| 37. | Lower head hair double (or three)..... | 38 |
| | Lower head hair single..... | 39 |
| 38. | Comb scales with the lateral spines as long as the apical one..... | <i>grossbecki</i> |
| | Comb scales with the lateral spines very short..... | <i>pretans</i> |
| 39. | Apical spine of the comb scales sharp and distinct..... | <i>estivalis</i> |
| | Apical spine of the comb scale subequal to the others..... | <i>subcantans</i> |
| 40. | Antennæ very long and slender..... | <i>laternaria</i> |
| | Antennæ normal, short, stout..... | 41 |
| 41. | Antennæ spinulated..... | 42 |
| | Antennæ smooth, the spinules obsolete..... | 43 |
| 42. | Anal gills normal, moderate..... | <i>lazarensis</i> |
| | Anal gills very short, bud-shaped..... | <i>quaylei</i> |
| 43. | Air tube conic-tapered; pecten long, very dense, slightly spiral; the secondary hairs normal..... | 44 |
| | Air tube cylindrical, bluntly rounded; pecten normal; short abdominal hairs stellate..... | <i>cyaneus</i> |
| 44. | Pecten followed by a single hair; labial plate low triangular with prominent side teeth..... | <i>knabi</i> |
| | Pecten followed by a small tuft; labial plate long triangular with small teeth..... | <i>insolita</i> |

Aedes tormentor, new species. Fig. 4.

This species was collected by Dr. Dupree in Baton Rouge, La., and named "*Culex serratus* Theob." as was also the species we describe as *atlanticus*. We do not believe that either of these forms are identical with the South American species, certainly they both cannot be. It is characterized in the table above.

Aedes bimaculatus Coquillett.

Culex bimaculatus Coquillett, Proc. U. S. Nat. Mus., xxv, 84, 1902.

Culex bimaculatus Dyar, Journ. N. Y. ent. soc., xi, 27, 1903.

Culex bimaculatus Dyar, Proc. ent. soc. Wash., v, pl. 2, f. 14, 1903.

Described from Brownsville, Texas. The larvæ were discovered by Dr. Dupree at Baton Rouge, La.

Aedes trichurus Dyar.

Culex trichurus Dyar, Journ. N. Y. ent. soc., xii 169, 1904.

Culex cinereoborealis Felt & Young, Science, n.s., xx, 505, 1904.

Culex cinereoborealis Felt, Bull. 79, N. Y. Sta. Mus., 314, 1904.

Culex trichurus Dyar, Journ. N. Y. ent. soc., xii, 244, 1904.

This is one of the early Spring species, the larvæ of which live in the pools formed by the melting snows. They hatch from overwintering eggs and are all developed by the first of May. There is only one generation a year. The species have a northern range. Our localities for this species are Springfield, Mass. (Dimmock), Plattsburgh, N. Y. (Dyar), Kaslo, B. C. (Dyar). We have no records from further North because no collections have been made there.

Aedes walkeri Theobald. Fig. 5.

Culex walkeri Theobald, Mon. Culic., i, 424, 1901.

Howardina walkeri Dyar, Journ. N. Y. ent. soc., xiii, 27, 1904.

Culex walkeri Blanchard, Les Moustiques, 312, 1905.

Howardina walkeri Blanchard, Les Moustiques, 416, 1905.

We have this peculiar larva from Dr. Grabham from Jamaica. A description has been published by the senior author, which is in error in stating that the long lateral hairs are absent; they are really present, although they have been broken off nearly all the specimens.

Aedes atropalpus Coquillett.

Culex atropalpus Coquillett, Can. ent., xxxiv, 292, 1902.

Culex atropalpus Dyar, Ent. news, x, 195, 1902.

Culex atropalpus Smith, Ent. news, xiii, 301, 1902.

Culex atropalpus Dyar, Proc. ent. soc. Wash., v, 144, 1903.

Culex atropalpus Dyar, Ent. news, xiv, 180, 1903.

Culex atropalpus Dyar, Journ. N. Y. ent. soc., xii, 172, 1904.

Culex atropalpus Felt, Bull: 79, N. Y. Sta. Mus., 306, 1904.

Culex atropalpus Smith, N. J. Agr. Exp. Sta., Rept. Mosq., 282, 1905.

Culex atropalpus Blanchard, Les Moustiques, 628, 1905.

This species ranges widely, from New Hampshire to Almoloya, Oaxaca, Mexico, where it was taken by the junior author. The only breeding places are the pot holes in rocks beside swift streams or cavities in rocks on the shores of lakes, filled by the waves during storms. It is remarkable that the species should be able to withstand the rush of water in flood, even if it be in the egg state.

Aedes busckii Coquillett. Fig. 6.

Stegomyia busckii Coquillett, Can. ent., xxxviii, 60, 1906.

Collected by Mr. Busck in Dominica and Guadeloupe. The locality given in the original description is an error.

Aedes abfitchii Felt.

Culex abfitchii Felt, Bull. 79, N. Y. sta. Mus., 381, 1904.

Culex abfitchii Dyar, Journ. N. Y. ent. soc., xiii, 29, 1904.

Culex siphonalis Smith & Grossbeck, Psyche, xii, 16, 1905.

Culex siphonalis Smith, N. J. Agr. exp. Sta., Rept. Mosq., 245, 1905.

One of the early Spring forms with northern distribution. The senior author collected specimens in Kaslo, B. C., which were named first "*Culex cantans* Meig." and a description published under that name (Journ. N. Y. ent. soc., xii, 36, 1904). Later the determination was changed to "*Grabhamia vittata* Theob.," but it cannot possibly be that species to judge from Theobald's figure (Can. ent., xxxv, 313, 1903). The figure is too sketchy to admit of placing the form in a table, though we conjecture it to be intended for some species of *Culiseta*.

Aedes aurifer Coquillett.

Culex aurifer Coquillett Can. ent., xxxv, 255, 1903.

Culex aurifer Smith, Ent. news, xv, 148, 1904.

Culex aurifer Dyar, Journ. N. Y. ent. soc., xii, 172, 1904.

Culex aurifer Felt, Bull. 79, N. Y. Sta. Mus., 337, 1904.

Culex aurifer Dyar, Journ. N. Y. ent. soc., xii, 244, 1904.

Culex aurifer Smith, N. J. Agr. exp. Sta., Rept. Mosq., 298, 1905.

One of the early Spring forms, which was discovered by Mr. J. T. Brakeley in New Jersey.

Aedes impiger Walker.

Culex impiger Walker, Cat. Dipt. Ins. Brit. Mus., i, 6, 1848.

Culex impiger Felt, Bull. 79, N. Y. Sta. Mus., 316, 1904.

Culex impiger Dyar, Journ. N. Y. ent. soc., xiii, 27, 1905.

Culex nigripes Blanchard (in part), Les Moustiques, 345, 1905.

One of the early Spring species which was discovered by Dr. E. P. Felt in northern New York. We are not at all sure that Walker's species is determinable, but having been thus fixed by Dr. Felt, it will be better to accept it. The species referred to by the senior author as *impiger* (Proc. ent. soc. Wash., vi, 37, 1904) is *pullatus* Coq., and the forms referred to by us (Proc. ent. soc. Wash., vi, 144, 1904,) are a mixture of *pullatus* Coq. and *trichurus* Dyar. Theobald and Blanchard refer our species to the synonymy of *nigripes* Zett. of Europe; but we have as yet no evidence that any of these American species occur in Europe.

***Aedes sylvestris* Theobald.**

- Culex sylvestris* Theobald, Mon. Culic., i, 406, 1901.
Culex cantans Dyar (not Meigen), Proc. ent. soc. Wash., v, 47, 142, 1902.
Culex sylvestris Smith, Ent. News, xiii, 303, 1902.
Culex sylvestris Dyar, Science, n. s., xvi, 672, 1902.
Culex sylvestris Smith, Rept. ent. Dept. N. J. Agr. exp. Sta., 540, 1903.
Culex sylvestris Johannsen, Bull. 68, N. Y. Sta. Mus., 422, 1903.
Culex sylvestris Smith, Bull. 171, N. J. Agr. exp. Sta., 25, 1904.
Culex sylvestris Felt, Bull. 79, N. Y. Sta. Mus., 291, 1904.
Culex sylvestris Smith, N. J. Agr. exp. Sta., Rept. Mosq., 251, 1905.
Culex montcalmi Blanchard, Les Moustiques, 307, 1905.

Probably the most generally abundant mosquito of the Atlantic region, breeding all Summer. It is a woods mosquito, the larvæ living in temporary rain pools. Near Washington, a large brood of *sylvestris* hatches in the early pools but it occurs also later after heavy rains. The eggs hibernate, scattered in the mud.

Prof. Blanchard has changed the name on the ground that *sylvestris* Theobald is preoccupied by *silvestris* Ross; but besides the slightly different spelling, Ross' name is said to be a "nomen nudum" and we therefore do not think that the change is required by the rules.

***Aedes fuscus* Osten-Sacken.**

- Aedes fuscus* Osten-Sacken, Bull. U. S. Surv., iii, 191, 1877.
Aedes fuscus Dyar, Journ. N. Y. ent. soc., x, 197, 1903.
Aedes fuscus Dyar, Proc. ent. soc. Wash., v, 145, 1903.
Aedes fuscus Felt, Bull. 79, N. Y. Sta. Mus., 340, 1904.
Aedes fuscus Smith, N. J. Agr. exp. Sta., Rept. Mosq., 335, 1905.
Aedes fuscus Blanchard, Les Moustiques, 402, 1905.

This occurs with the preceding and has the same habits, though the distribution is more northern. We have not taken it around Washington.

***Aedes punctor* Kirby.**

- Culex punctor* Kirby, Faun. Bor.-Am., iv, 308, 1837.
Culex punctor Dyar, Proc. ent. soc. Wash., vi, 39, 1904.
Culex aberratus Felt & Young, Science, N. S., xx, 505, 1904.
Culex punctor Dyar, Journ. N. Y. ent. soc., xii, 169, 245, 1904.
Culex punctor Blanchard, Les Moustiques, 359, 1905.

One of the early Spring forms, all of which have similar habits and distribution. We have little idea that this is the species actually in-

tended by Kirby, but just what that was will probably never be known, and this species will do as well as another to represent the name. It is a distinct and easily recognized larva and comes very early. We got them near Springfield, Mass. in a marsh still containing ice, on which we stood to collect them and beneath which the larvæ retreated.

Aedes meridionalis, new species. Fig. 7.

Antennæ with the tuft before the middle; head hairs single; lateral hairs single after the second abdominal segment. Air tube 2×1 , pecten short, reaching over one-half, followed by a large hair tuft; comb of twelve scales in a straight row. Anal segment broadly ringed.

Taken by the junior author in the forest beyond settlement, Las Loras, near Puntarenas, Costa Rica, in a pond choked by vegetation which is dry in the dry season. The specimen was named "*Janthin-osoma musica* Say" by Mr. Coquillett.

Aedes dupreei Coquillett.

Culex dupreei Coquillett, Can. ent., xxxvi, 10, 1904.

Culex dupreei Smith, Ent. News, xv, 49, 1904.

Culex dupreei Felt, Bull. 79, N. Y. Sta. Mus., 335, 1904.

Culex dupreei Smith, N. J. Agr. exp. Sta., Rept. Mosq., 283, 1905.

In this peculiar larva the air tube is nearly or quite functionless and it lives at the bottom among leaves. It is recorded from New Jersey and Louisiana. Mr. Busck got it at Arima, Trinidad, in a deep virgin Palm swamp in permanent water. He says "it reminds one of a Japanese gold-fish with its very long floating tail hairs." One specimen was taken by the junior author associated with the preceding species.

Aedes philosophicus, new species. Fig. 8.

The characters are indicated in the table. It was collected by the junior author at Tehuantepec, Salina Cruz, Acapulco, Mexico, and Sonsonate, Salvador. The specimens were named "*Hæmagogus equinus* Theobald" by Mr. Coquillett, but we are unaware that any species has been so named. The *Culex equinus* of Linnæus and Fabricius is said to be probably a *Simulium*.

Aedes triseriatus Say.

Culex triseriatus Say, Journ. Acad. Nat. S., Phil, iii, 12, 1823.

Culex triseriatus Smith, Ent. news, xiii, 301, 1902.

Culex triseriatus Dyar, Journ. N. Y. ent. soc., xi, 25, 1902.

Culex triseriatus Dyar, Science, n. s., xvi, 672, 1902.

Culex triseriatus Johannsen, Bull. 68, N. Y. Sta. Mus., 423, 1903.

Culex triseriatus Felt, Bull. 79, N. Y. Sta. Mus., 336, 1904.

Culex triseriatus Smith, N. J. Agr. exp. Sta., Rept. Mosq., 275, 1905.

Culex triseriatus Blanchard, Les Moustiques, 288, 1905.

The larva lives in holes in trees, occasionally frequenting rain water barrels, especially if placed in the woods. We have the species from all along the Atlantic coast, but only from the continent. The senior author and Mr. Caudell got it at New Smyrna, Florida, which is our southernmost record.

***Aedes albonotata* Coquillett. Fig. 9.**

Gynometopa albonotata Coquillett, Proc. ent. soc. Wash., vii, 183, 1906.

Collected by Mr. Busck in the San Francisco Mts. of San Domingo. They were in bamboo stalks. Mr. Busck describes them as "snaky-looking larvæ, ringed with red, pretty and distinctly marked."

***Aedes calopus* Meigen. Fig. 10.**

*Culex fassiatu*s Fabricius (not Meigen), Syst. Antliat., 36, 1805.

Culex calopus Meigen, Syst. beschr. bek. eur. Zweifl. Ins., i, 3, 1818.

Stegomyia fasciata Theobald, Mem., Liverp. Sch. Trop. Med., iv, App., iii, 1901.

Stegomyia fasciata Howard, Mosquitoes, 135, 1901.

Stegomyia fasciata Dupree and Morgan, Science, n. s., xvi, 1037, 1902.

Stegomyia fasciata Dyar, Proc. ent. soc. Wash., v, 51, 146, 1903.

Stegomyia fasciata Parker, Beyer & Pothier, Bull. 13, Yellow Fev. Inst., 25, 1903.

Stegomyia fasciata Taylor, Le Rev. de Med., Trop., 1903.

Stegomyia fasciata Theobald, Mon. Culic., iii, 142, 1903.

Stegomyia calopus Blanchard, Les Moustiques, 249, 1905.

The well-known "yellow fever mosquito," a strictly domestic form. It was found by Mr. Busck and the junior author in nearly every town visited in the tropics. It occurs in the United States sometimes as far North as Virginia, but in March, the senior author and Mr. Caudell found it only at Key West and Miami, Florida, below the line of hard frost.

***Aedes mediovittata* Coquillett. Fig. 11.**

Stegomyia mediovittata Coquillett, Can. ent., xxxviii, 60, 1906.

Mr. Busck got a lot of these peculiar larvæ in San Domingo. They differ from all our species in having the pecten of the air tube strongly spirally twisted. Mr. Busck's localities are: a pot-hole in coral rock, in a coral rock cave, in a hollow trunk of a royal palm 40 feet from the ground and twice in hollow palm trunks, San Francisco Mts.

Aedes sollicitans Walker.

- Culex sollicitans* Walker, Ins., Saund., Dipt., i, 427, 1856.
Culex sollicitans Dyar, Journ. N. Y. ent. soc., x, 197, 1902.
Culex sollicitans Smith, Ent. News, xiii, pl. f. 4, 1902.
Culex sollicitans Smith, Sp. Bull. N. J. Agr. Exp. Sta., July, 1902.
Culex sollicitans Dyar, Proc. ent. soc. Wash., v. 47, 1902.
Culex sollicitans Smith, Psyche, x, 1, 1903.
Culex sollicitans Smith, Rept. ent., Dept., N. J. Agr., Exp., Sta., 515, 1903.
Culex sollicitans Smith, Bull. 171, N. J. Agr. Exp. Sta., 17, 1904.
Culex sollicitans Felt, Bull. 79, N. Y. Sta. Mus., 295, 1904.
Culex sollicitans Smith, N. J. Agr. Exp. Sta., Rept. Mosq., 203, 1905.
Culex sollicitans Blanchard, Les Moustiques, 295, 1905.

The well-known "New Jersey mosquito" breeding in the salt water marshes and pools left by high tides along the Atlantic coast from Maine to Florida. The senior author found it at New Smyrna, Florida. We do not know if it extends into the tropics.

Aedes mitchellæ Dyar.

- Culex mitchellæ* Dyar, Journ. N. Y. ent. soc., xiii, 74, 185, 187, 1905.

Found by the senior author and Mr. Caudell in Georgia and Florida. It is nearly allied to the preceding, but differs in habits, living in temporary rain-water puddles away from the coast.

Aedes trivittatus Coquillett.

- Culex trivittatus* Coquillett, Journ. N. Y. ent. soc., x, 193, 1902.
Culex trivittatus Smith, Ent. News, xv, 145, 1904.
Culex trivittatus Felt, Bull. 79, N. Y. Sta. Mus., 333, 1904.
Culex trivittatus Smith, N. J. Agr. exp. Sta., Rept. Mosq., 288, 1905.
Culex trivittatus Blanchard, Les Moustiques, 339, 1905.

Known as yet only from New Jersey. We have not personally collected the species; the credit for its discovery belongs to Prof. J. B. Smith.

Aedes auroides Felt.

- Culicelsa auroides* Felt, Bull. 79, N. Y. Sta. Mus., 449, 1905.

One of the early Spring species detected in northern New York by Dr. Felt. We have as yet no additional localities.

Aedes infirmatus, new species. Fig. 12.

With the characters given in the table. The specimens were obtained by Dr. Dupree at Baton Rouge, La., and determined by Mr. Coquillett as "*Culex confirmatus* Arrib." a determination which appears to us too improbable to accept.

Aedes damnosus Say. Fig. 13.

Culex damnosus Say, Jn. Acad. nat. soc. Phil., iii, 11, 1823.

Culex teniorhynchus Smith (not Wiedemann), Ent. News, xiii, 300, 1902.

Culex teniorhynchus Dyar, Journ. N. Y. ent. soc., xi, 13, 1903.

Culex teniorhynchus Dyar, Proc. ent. soc. Wash., v, 146, 1903.

Culex teniorhynchus Smith, Rept. ent. Dept. N. J. Exp. Sta., 530, 1903.

Culex teniorhynchus Taylor, Rev. de Med. Trop. June, 1903.

Culex teniorhynchus Smith, Bull., 171, N. J. Agr. exp. Sta., 21, 1904.

Culex teniorhynchus Felt, Bull. 79, N. Y. Sta. Mus., 302, 1904.

Culex teniorhynchus Smith, N. J. Agr. Exp. Sta., Rept. Mosq., 219, 1905.

Culex teniorhynchus Blanchard, Les Moustiques, 291, 1905.

This species occurs along the Atlantic coast from Rhode Island to Florida. It has been identified with *teniorhynchus* Wied., described from Brazil, but we have felt too doubtful of the correctness of that to adopt the name. The larvæ inhabit pools near the sea, not necessarily salt. The senior author and Mr. Caudell found them in myriads at New Smyrna, Florida, in a large pool just across a road from salt water.

Collected by the junior author at Champerico, Mexico, in a big marsh behind the beach in brackish water; at San José de Guatemala in a puddle near the town; near Puntarenas, Costa Rica, at the head of a mangrove-lined inlet in muddy puddles.

Aedes habanicus, new species. Fig. 14.

Antennæ rather small with the tuft at the middle; head hairs single; body coarsely hairy; lateral hairs mostly lost, but two are present on the sixth abdominal segment; air tube two-and-a-half times as long as wide, the pecten reaching to the middle, followed by the hair tuft; anal segment broadly ringed by the plate; anal gills short, about as long as the segment.

Havana, Cuba, Oct. 28, 1903, from Mr. John R. Taylor, labelled "*Culex confirmatus* Arrib." we do not know on whose authority. They were associated with many *Psorophora ciliata*, and doubtless came from some temporary pool or swamp.

Aedes atlanticus, new species. Fig. 15

Culex serratus, Smith (not Theobald), Ent. news, xiv, 309, 1903.

Culex serratus, Felt (not Theobald), Bull. 79, N. Y. sta. Mus., 334, 1904.

Culex serratus, Smith (not Theobald), N. J. Agr. exp. sta., Rept. Mosq., 279, 1905.

Figured by Prof. J. B. Smith under the name "*Culex serratus* Theobald" as determined for him by Mr. Coquillett (N. J. Agr. exp.

Sta., Rept. Mosq., 280, fig 86, 1805). While it is possible that this is the true *serratus* of Theobald, described from Brazil and Guiana, we do not think it is probable, especially in view of what we note under *Aedes tormentor* above. We therefore propose a new name for the Atlantic coast form. Prof. Smith has taken it in New Jersey and the senior author at Sanford, Florida.

***Aedes inconspicuus* Grossbeck.**

Culex inconspicuus Grossbeck, Ent. News, xv, 313, 1904.

Culex inconspicuus Smith & Grossbeck, Psyche, xii, 18, 1905.

Culex inconspicuus Smith, N. J. Agr. Exp. Sta., Rept. Mosq., 297, 1905.

One of the Spring species detected by Mr. Grossbeck. Its range is unknown, as no other specimens have been collected.

***Aedes hemisurus*, new species.**

This is the species figured by Dr. Grabham from Jamaica (Can. ent., xxxvii, 405, 1905) as "*Culex confirmatus* Arrib." We do not believe that the insular form can be conspecific with the one described from the Argentine, especially as it is very different from the one identified as *confirmatus* from the United States. (See *Aedes infirmatus* above) We therefore propose a new name.

***Aedes euplocamus*, new species. Fig. 16.**

Antennal tuft small, at the middle; head hairs single. Air tube a little over 2 x 1 with even pecten of 12 teeth to the middle. Anal segment ringed; gills long, pointed, spotted.

Collected by the junior author at Zent, near Port Limon, Costa Rica, in a ditch. It was named "*Culex trivittatus* Coq." by Mr. Coquillett, but the larva disagrees.

***Aedes fitchii* Felt & Young.**

Culex fitchii Felt & Young, Science n. s., xx, 505, 1904.

Culex fitchii Felt, Bull. 79, N. Y. Sta. Mus., 282, 1904.

Culex siphonalis Grossbeck, Can. ent., xxvi, 332, 1904.

Culex fitchii Dyar, Journ. N. Y. ent. soc., xii, 246, 1904.

One of our early Spring forms with northern distribution. The larva is readily recognizable by the long tube and the narrow angled tracheæ.

***Aedes varipalpus* Coquillett.**

Culex varipalpus Coquillett, Can. ent., xxxiv, 292, 1902.

Culex varipalpus Dyar, Proc. ent. soc. Wash., vi, 40, 1904.

Culex varipalpus Dyar, Journ. N. Y. ent. soc., xii, 90, 1904.

Culex varipalpis Blanchard, Les Moustiques, 628, 1905.

A western species, probably a hollow tree feeder. The only larvæ found were in an artificial receptacle.

***Aedes canadensis* Theobald.**

Culex canadensis Theobald, Mon. Culic., ii, 3, 1901.

Culex canadensis Smith, Ent. News, xiii, 267, 1902.

Culex canadensis Dyar, Science, n. s., xvi, 672, 1902.

Culex canadensis Dyar, Journ. N. Y. ent. soc., x, 194, 1902.

Culex canadensis Smith, Ent. News., xiii, 300, 1902.

Culex canadensis Dyar, Proc. ent. soc. Wash., v, 141, 1903.

Culex canadensis Smith, Bull, 171, N. J. Agr. Exp. Sta., 27, 1904.

Culex canadensis Felt, Bull. 79, N. Y. Sta. Mus., 304, 1904.

Culex canadensis Smith, N. J. Agr. Exp. Sta., Rept. Mosq., 267, 1905.

Culex canadensis Blanchard, Les Moustiques, 316, 1905.

A very common woods species, breeding in temporary pools all Summer, most abundantly in early Spring. Its distribution is northern, although it occurs sparingly as far South as Washington, D. C., where we have taken it, and even at Jacksonville, Florida, where it was taken by the senior author and Mr. Caudell.

***Aedes nivitarsis* Coquillett.**

Culex nivitarsis Coquillett, Proc. ent. soc. Wash., vi, 168, 1904.

Culex nivitarsis Smith & Grossbeck, Psyche, xii, 14, 1905.

Culex nivitarsis Smith, N. J. Agr. Exp. Sta., Rept. Mosq., 229, 1905.

A species discovered by Mr. Grossbeck in New Jersey. We have not been able to separate the larva from that of *canadensis*, but that may be due to the fragmentary condition of the material.

***Aedes cantator* Coquillett.**

Culex cantator Coquillett, Can. ent., xxxv, 255, 1903.

Culex cantator Smith, Bull. 171, N. J. Agr. Exp. Sta., 22, 1904.

Culex cantator Felt, Bull. 79, N. Y. Sta. Mus., 293, 1904.

Culex cantator Dyar, Journ. N. Y. ent. soc., xiii, 28, 1905.

Culex cantator Smith, N. J. Agr. Exp. Sta., Rept. Mosq., 238, 1905.

The species breeds near the sea shore along the northern Atlantic coast, not necessarily in salt water. It breeds all Summer, apparently.

Aedes pullatus Coquillett.

Culex impiger Dyar, Proc. ent. soc. Wash., vi, 37, 1904.

Culex impiger Dyar & Knab (in part), Proc. ent. soc. Wash., vi, 144, 1904.

Culex pullatus Coquillett, Proc. ent. soc. Wash., vi, 168, 1904.

Culex pullatus Dyar, Journ. N. Y. ent. soc., xii, 245, 1904.

One of the early spring species, very abundant in snow water in the Selkirks of eastern British Colombia. It possibly has a northern distribution, but no data are available, as all the black-legged species have been lumped under *nigripes* Zett. in the literature.

Aedes grossbecki, new species.

Culex squamiger Smith (not Coquillett), Ent. News, xv, 80, 1904.

Culex squamiger Smith & Grossbeck, Psyche, xii, 13, 1905.

Culex squamiger Smith, N. J. Agr. Exp. Sta., Rept. Mosq., 224, 1905.

Culex curriei Dyar (in part), Journ. N. Y. ent. soc., xiii, 28, 1905.

Culex squamifer Blanchard (in part), Les Moustiques, 630, 1905.

The New Jersey specimens identified as "*Culex squamiger* Coq." by Mr. Coquillett and published by Prof. Smith we fully believe to be a distinct species. Mr. Quayle records (Can. ent., xxxviii, 27, 1906) the true *squamiger* (Coquillett, Proc. U. S. Nat. Mus., xxv, 85, 1902) as a salt marsh species from the Californian coast, to which it is no doubt confined. The New York records of "*Grabhamia curriei* Coq." seem to refer to the present species. Unfortunately we have not been able to secure Californian larvæ for comparison, although Mr. Quayle kindly endeavored to supply us. It is quite possible that the *Culex onondagensis* Felt (Bull. 79, N. Y. Sta. Mus., 304, 1904) may prove to be this species, in which case our new name may be placed in the synonymy.

Aedes pretans Grossbeck.

Culex pretans Grossbeck, Ent. News., xv, 332, 1904.

Culex pretans Smith & Grossbeck, Psyche, xii, 17, 1905.

Culex pretans Smith, N. J. Agr. exp. Sta., Rept. Mosq., 293, 1905.

Culex pretans Britton & Viereck, Rept. Conn. Agr. Ex. Sta. 1904, pt. iii, pl., xii, 1905.

One of the early Spring forms. Its distribution seems to be less northern than some of the others.

Aedes æstivalis Dyar.

Culex æstivalis Dyar, Journ. N. Y. ent. soc., xii, 245, 1904.

Common in the Selkirks of eastern British Colombia, the adults flying later than the earliest Spring species, of which this is probably

***Aedes subcantans* Felt.**

- Culex cantans* Smith (not Meigen), Ent. News, xiii, 300, 1902.
Culex cantans Johannsen (not Meigen), Bull. 68, N. Y. Sta. Mus., 420, 1903.
Culex cantans Smith (not Meigen), Bull. 171, N. J. Agr. Exp. Sta., 24, 1904.
Culex cantans Dyar (not Meigen), Journ. N. Y. ent. soc., xii, 174, 1904.
Culex cantans Felt (not Meigen), Bull. 79, N. Y. Sta. Mus., 286, 1904.
Culex cantans Smith (not Meigen), N. J. Agr. Exp. Sta., Rept. Mosq., 242, 1905.
Culicada subcantans Felt, Bull. 97, N. Y. Sta. Mus., 474, 1905.

One of the early Spring forms, occurring in the northeastern United States. This is probably the *Culex stimulans* Walker (Cat. Brit. Mus., Dipt., i, 4, 1848); the types should be compared.

***Aedes laternaria* Coquillett. Fig 17.**

Verrallina laternaria Coquillett, Proc. ent. soc. Wash., vii, 184, 1906.

Collected by Mr. Busck in a hollow tree in Trinidad.

***Aedes lazarensis* Felt & Young.**

- Culex lazarensis* Felt and Young, Science, n. s., xx, 505, 1904.
Culex lazarensis Felt, Bull. 79, N. Y. Sta. Mus., 310, 1904.
Culicada lazarensis Felt, Bull. 79, N. Y. Sta. Mus., 478, 1905.

One of the early Spring forms not uncommon in northern New York. The senior author has collected it in Plattsburgh.

***Aedes quaylei*, new species.**

- Culex curriei* Coquillett (in part), Can. ent. xxxiii, 259, 1901.
Grabhamia curriei Theobald (in part), Mon. Culic., iii, 249, 1903.
Culex curriei Blanchard (in part), Les Moustiques, 285, 1905.
Grabhamia curriei Dyar (in part), Journ. N. Y. ent. soc. xiii, 28, 1905.
Culex curriei Quayle, Ent. News, xvii, 4, 1906.

This species is the salt marsh form of the Pacific Coast, as shown by Quayle. The types of *curriei* were from diverse localities, but the North Dakota specimen must be regarded as the actual type in restricting it. This form has never been bred; it cannot be the same species as the Californian salt marsh species. It may be conspecific with the specimens from New York mentioned above under *A. grossbecki*, but this has yet to be proved.

***Aedes cyaneus* Fabricius. Fig 18.**

- Culex cyaneus* Fabricius, Syst. Antliat., 35, 1905.
Hemagogus cyaneus Blanchard, Les Moustiques, 112, 1805.

Mr. Busck brought some living larvæ from San Domingo collected in bamboo joints. The junior author found it at Sonsonate, Salvador,

and Port Limon, Costa Rica, in water in cocoanut shells and cacao husks.

Aedes knabi Coquillett. Fig. 19.

Culex knabi Coquillett, Proc. ent. soc. Wash., vii, 183, 1906.

Collected by the junior author at Tehuantepec, Mexico, in a hollow in a mango tree and at Salina Cruz, Mexico, also in a tree hole.

Aedes insolita Coquillett. Fig. 20.

Verrallina insolita Coquillett, Can. ent. xxxviii, 62, 1906.

Collected by the junior author at Tehuantepec, Salina Cruz, Almoloya, Mexico; Sonsonate, Salvador, and Puntarenas, Costa Rica. The larvæ were all in holes in trees except in one instance, at Tehuantepec, they were in a (cemented) tank in a shaded part of the garden at the public bath house.

Genus CULISETA Felt.

Theobaldia Neveu-Lemaire (not *Theobaldius* Nevill), C. R. heb. soc. Biol., liv, 1329, 1902.

Culiseta Felt, Bull. 79, N. Y. Sta. Mus., 391 c, 1904.

Theobaldinella Blanchard, Les Moustiques, 390, 1905.

The larvæ of this genus are extremely similar; the following small differences appear to hold for the species. The European *annulatus* Schrank is recorded from the West coast of America, but we have seen no larvæ. Meinert's excellent figure as well as Theobald's (Mon. Culic., iii, 150, 1903) show it to be a *Culiseta*, but neither is detailed enough to let us place the larva in the table. *Grabhamia vittata* Theobald (Can. ent. xxxv, 313, 1903) probably belongs here likewise. (See remarks under *Aedes abfitchii*).

Table of species.

- | | |
|---|--------------------|
| 1. Lower head tuft with three long hairs, upper multiple..... | 2 |
| Both head tufts multiple, alike..... | <i>absobrinus</i> |
| 2. Basal pecten teeth of the air tube furcate..... | <i>incidens</i> |
| Basal pecten teeth of the air tube with many branches..... | <i>consobrinus</i> |

Culiseta incidens Thomson.

Culex incidens Thomson, Kongl. Sven. Freg. Eugenies Resa omk. jood., Dipt., 443, 1868.

Culex incidens Dyar, Proc. ent. soc. Wash., vi, 38, 1904.

Culex nigripes Blanchard (not Zetterstedt), Les Moustiques, 345, 1905.

Theobaldinella incidens Blanchard, Les Moustiques, 393, 1905.

The species is common in the western United States to the Pacific coast, the larvæ occurring in water barrels and tanks as *Culex pipiens* does in the East, although not so exclusively a domestic mosquito. The eggs are laid in boats. Our easternmost record is Banff, Alberta, where the senior author collected it in sulphurous pools.

***Culiseta absobrinus* Felt.**

Culex absobrinus Felt, Bull. 79, N. Y. Sta. Mus., 318, 1904.

Culex absobrinus Dyar, Journ. N. Y. ent. soc., xiii, 24, 1905.

Theobaldia absobrinus Dyar, Journ. N. Y. ent., soc., xiii, 107, 1905.

The species has a northern distribution, being recorded from Elizabethtown and Tupper Lake, New York, and Kaslo, British Columbia. The larvæ occur in permanent pools in the same manner as *C. incidens*. We have not found them in artificial receptacles.

***Culiseta consobrinus* Desvoidy.**

Culex consobrinus Desvoidy, Mem. soc. d'his. nat., Paris, iii, 408, 1827.

Culex consobrinus Dyar, Journ. N. Y. ent. soc., xi, 24, 1903.

Culex consobrinus Dupree & Morgan, Science, n. s., xvi, 1036, 1902.

Culex magnipennis Felt, Bull. 79, N. Y. Sta. Mus., 324, 1904.

Culex consobrinus Dyar, Journ. N. Y. ent. soc., xiii, 26, 1905.

Culex consobrinus Blanchard, Les Moustiques, 352, 1905.

The species occurs throughout the eastern United States. We have it from Baton Rouge, La. (Dupree), Urbana, Ill. (Knab), Jacksonville, Fla. (Dyar), Albany, N. Y. (Felt). Professor Blanchard gives western localities, which we have not seen verified by any specimens from beyond the Rocky Mountains. The larvæ live in permanent water, often in pools left in the beds of streams in well shaded places.

Genus *CULICELLA* Felt.

Culicella Felt, Bull. 79, N. Y. Sta. Mus., 391c, 1904.

***Culicella dyari* Coquillett.**

Culex dyari Coquillett, Journ. N. Y. ent. soc., x, 192, 1902.

Culex dyari Blanchard, Les Moustiques, 364, 1905.

The larva is one of the early Spring forms, although rather late in the cold northern bogs. It is the only larva of the long-tubed series that has such a habit. We took the species not uncommonly early in Spring near Springfield, Mass., and the senior author has collected it in New Hampshire, northern New York and eastern British Co-

lumbia. It undoubtedly has a northern range, like all the early Spring forms that hibernate in the egg state.

Genus *CULEX* Linnæus.

Culex Linnæus, Syst. nat., ed. x, 602, 1758.

Melanoconion Theobald, Mon. Culic., iii, 238, 1903.

Melanoconium Blanchard, Les Moustiques, 395, 1905.

Neoculex Dyar, Proc. ent. soc. Wash., vii, 48, 1905.

Micraëdes Coquillett, Proc. ent. soc. Wash., vii, 185, 1906

Tinolestes Coquillett, Proc. ent. soc. Wash., vii, 185, 1906.

The larvæ typically have the antennæ with a large tuft at about the outer third, beyond the middle, the part before the tuft thick, that beyond it slender; air tube long, over four times as long as wide with several tufts along the posterior edge; anal segment uniformly ringed by a chitinous band, the ventral brush confined to the barred area. Certain species diverge from this type in the degeneration of the antennæ, which come to resemble those of *Aedes*. Others diverge in the shortening of the air tube. In two species both these divergences coexist and, although they still retain the multiple tufts of the air tube, we have been obliged to include their names in both the tables of the species of *Aedes* and *Culex* to avoid confusion. It happens that some *Aedes* have the anal segment ringed, and one (*trichurus* Dyar) has multiple tufts on the tube, which renders the absolute definition of these genera difficult when the aberrant forms are included.

Table of species.

1. Antennæ with the tuft at the middle of the uniformly shaped joint..... 2
 Antennæ with the tuft outwardly placed, the part beyond slender..... 5
2. Air tube very long (8 x 1), pecten teeth long spines; abdominal hairs in coarse stellate tufts..... *bisulcatus*
 Air tube shorter, about four times as long as wide..... 3
 Air tube only about two-and-a-half times as long as wide..... 4
3. Antennæ with a tuft; anal segment smooth..... *restuans*
 Antennæ with a single hair; anal segment spined..... *pleuristriatus*
4. Ring of anal segment narrow; pecten not to half of the tube; two tufts within pecten, two beyond in line..... *janitor*
 Ring of anal segment broad; pecten over half of tube; two tufts within, two beyond not in line, two on dorsal aspect..... *lactor*
5. Air tube three times as long as wide or less..... 6
 Air tube four times as long as wide or over..... 7
6. Body pilose; pecten of the air tube to three-fourths..... *interrogator*
 Body spicular-granular; pecten of the air tube small, to one-third *barbarus*

7. Anal appendages only two.....*bahamensis*
 Anal appendages four, normal.....8
8. Air tube with three paired tufts posteriorly outwardly, the middle one
 moved laterad out of line, usually situated near or not much beyond
 the middle of the tube.....9
 Air tube with four paired tufts posteriorly outwardly (sometimes increased
 by additional ones basally), the subapical one moved laterad out of
 line, usually situated at the outer third of the tube.....14
 Air tube with four to ten paired tufts along the posterior line in a straight
 row, none displaced, or the hairs obsolete or absent.....18
9. Body glabrous; air tube 7 x 1; antennæ dark.....*mortificator*
 Body spicular or pilose.....10
10. Dislocated tuft of tube well beyond the middle.....*carmodyæ*
 Dislocated tuft of tube not, or scarcely beyond the middle.....11
11. Anal processes broad and bluntly rounded.....12
 Anal processes long and tapered, rather sharply pointed.....13
12. Air tube subfusiform, tapered on outer half; body spicular.....*extricator*
 Air tube gently tapered uniformly; body pilose.....*declarator*
13. Air tube very slightly flared at tip; pecten very long, as long as the
 diameter of the tube at the middle.....*proclamator*
 Air tube regularly tapered on outer two-thirds to tip; pecten long hut not
 equalling half the diameter of the tube.....*inquisitor*
14. Air tube long, over 5 x 1, the sides nearly straight without marked taper-
 ing.....15
 Air tube less than five times as long as wide, the sides curved, tapering
 rather rapidly after the middle, subfusiform.....17
15. Body glabrous.....*salinarius*
 Body spicular-pilose.....16
16. Air tube 8 x 1, the tufts 3-haired and short; antennæ dark.....*habilitator*
 Air tube 6 x 1, the tufts 2-haired and long; antennæ pale at base.....*factor*
 Air tube 7 x 1, the tufts single and very long; antennæ pale.....*regulator*
17. Air tube 5 x 1, pecten teeth about 15; subdorsal hairs of abdominal seg-
 ments 3 and 4 double.....*pipiens*
 Air tube 4 x 1, pecten teeth about nine; subdorsal hairs of abdominal
 segments 3 and 4 single.....*cubensis*
18. Air tube with a subapical crown of spikes; body pilose.....*coronator*
 Air tube without a crown of spikes, smooth throughout.....19
19. Air tube with long well-defined tufts.....20
 Air tube with small double or single hairs, or bare.....31
20. Body spicular-pilose.....21
 Body glabrous or lightly granular.....26
21. Five tufts on posterior margin of tube subequal in length, short; lateral
 abdominal hairs in twos on segments 3 to 5.....22
 Five tufts on tube with the basal one very long, the rest progressively
 shorter; abdominal hairs in threes on segments 3 to 5.....23

22. Air tube 11 x 1; upper head hair double; pecten of air tube moderate
derivator
Air tube 6 x 1; upper head hair single; pecten long *investigator*
Air tube 6 x 1; upper head hair multiple; pecten rather long. *inhibitor*
23. Upper head hair triple; tufts of tube long, the basal one over half the
length of the tube *mutator*
Upper head hair single; tufts of tube all shorter than half its length 24
24. Pecten of tube dense and fine, not as long as diameter of tube. 25
Pecten sparse and open, equalling the diameter of the tube at middle
elevator
25. Dorsal hairs stellate, long; antennæ dark. *educator*
Dorsal hairs small; antennæ pale at base. *conspirator*
26. Air tube concave, the tip expanded. 27
Air tube regularly tapered, the tip not widened. 28
27. Pecten of air tube short; antennæ pale at base; lateral comb of the eighth
segment a large patch of spines. *territans*
Pecten of the air tube of long spines; antennæ dark; lateral comb of
the eighth segment scarcely over two rows deep. *simulator*
28. Both head hairs single. *gravitator*
Upper head hair triple, lower single. *decorator*
Both head hairs triple or multiple. 29
29. Lateral abdominal hairs in threes after the second segment; body glabrous;
air tube not over five times as long as wide. *tarsalis*
Lateral abdominal hairs in twos after the second segment; body spicular-
granular; air tube 6 x 1. 30
30. Air tube with ten close tufts; antennæ pale at base; dorsal tufts of anal
segment 1 + 3 on each side. *secutor*
Air tube with six to seven sparse tufts; antennæ dark; dorsal tufts of anal
segment 1 long + 1 long and one short. *lamentator*
31. Air tube very long with a swelling at outer fourth. *daumasturus*
Air tube uniform, without any swelling. 32
32. Air tube with slight tufts. 33
Air tube with single hairs or bare. 37
33. Pecten of the air tube reaching to one-third (Dr. Grabham). 34
Pecten of the air tube reaching one-fourth or less. 35
34. Pecten short and broad, the tube 8 x 1, slightly curved forward; labial plate
with subbasal tooth projecting. *microsquamosus*
Pecten long, the tube 10 x 1; labial plate with even teeth. *atratus*
35. Pecten dense and fine; lateral hairs in threes after the second segment
carcinophilus
Pecten sparse and long. 36
36. Lateral hairs in twos after the second segment; comb of the eighth seg-
ment of very long spines. *rejector*
Lateral hairs in fours after the second segment; comb of shorter spines
and more rows deep. *vector*

37. Pecten of the air tube of five teeth, the last two long and remote, on the basal one-seventh of the tube *inimitabilis*
 Pecten of numerous teeth densely and regularly spaced 38
38. Lateral abdominal hairs single on segments 3 to 5 *conservator*
 Lateral abdominal hairs double on segments 3 to 5 39
39. Air tube with four rather long single hairs on posterior margin... *restrictor*
 Air tube with a single small hair or none 40
40. Pecten of the air tube reaching to one-fourth *divisor*
 Pecten of the air tube reaching to one-third *latisquamma*

Culex bisulcatus Coquillett. Fig. 21.

Micraëdes bisulcatus Coquillett, Proc. ent. soc. Wash., vii, 185, 1906.

The antennæ have the tuft at the middle; the head tufts multiple; air tube very long with long pecten reaching nearly half way, followed by scattered tufts. Anal segment with the chitinous ring furnished with long spines on the posterior edge.

The specimens were collected by Mr. Busck in Guadeloupe on the Soufrière, 3,000 feet altitude, and in San Domingo, from larvæ in Bromelias and leaf angles of Spanish Bayonet.

Culex restuans Theobald.

Culex restuans Theobald, Mon. Culic., ii, 142, 1901.

Culex restuans Dyar, Journ. N. Y. ent. soc., x, 199, 1902.

Culex restuans Smith, Ent. News, xiii, 302, 1902.

Culex restuans Dyar, Ent. News, xiv, 41, 1903.

Culex restuans Dyar, Proc. ent. soc. Wash., v, 144, 1903.

Culex restuans Johannsen, Bull. 68, N. Y. Sta. Mus., 417, 1903.

Culex restuans Smith, Bull. 171, N. J. Agr. Exp. Sta., 16, 1904.

Culex restuans Dyar & Knab, Proc. ent. soc. Wash., vi, 143, 1904.

Culex restuans Felt, Bull. 79, N. Y. Sta. Mus., 326, 1904.

Culex restuans Smith, N. J. Agr. Ex. Sta., Rept. Mosq., 315, 1905.

The larva is apparently a normal inhabitant of hollow trees and dirty permanent pools. It is a wild species, native to the northeastern part of the continent, but takes very kindly to rain water barrels and other artificial breeding places. In places well removed from the seaboard and from large towns, where *Culex pipiens* has not yet penetrated, it is the dominant species in water barrels. Nearer the coast, it appears mixed with *pipiens*. The eggs are laid in rafts and the early stages are closely similar to *pipiens*, although the larva is readily enough distinguished by the structure of the antennæ.

Culex pleuristriatus Theobald. Fig. 22.

Culex pleuristriatus Theobald, Mon. Culic., iii, 177, 1903.

Culex pleuristriatus Bourroul, Mosq. do Brasil, 43, 1904.

Described from Brazil. Mr. Coquillett has given us the name for a specimen from Trinidad from Mr. F. W. Urich, bred from Bromelia water. Its peculiar characters are indicated in the table. The mosquito fauna of the Bromelias is very rich, both in Sabethines and members of the genus *Culex*, as well as the *Megarhinus* that prey on them.

Culex janitor Theobald.

Culex janitor Theobald, Mon. Culic., iii, 182, 1903.

Culex janitor Grabham, Can. ent., xxxvii, 406, 1905.

Described from Jamaica. Dr. Grabham figures the larva which we have not seen in nature. Mr. Coquillett applied the name tentatively to a very different species, to which we shall refer further on.

Culex lactator, new species. Fig. 23.

With the characters given in the table; a very distinct form. The larva contradicts both the characters which usually define the species of *Culex*, but we nevertheless believe that it belongs here. The anal segment has the normal structure of all the *Culex* species.

The larvæ were taken by the junior author in puddles at Cordoba, Santa Lucrecia, Rincon Antonio, Tehuantepec and Almoloya, Mexico; Puntarenas and San José, Costa Rica. The adults were named "*Culex? secutor* Theob." and mixed with another species (*C. coronator* D. & K.) under this name. Compare our remarks under *Culex secutor* and *Janthinosoma scholasticus*.

Culex interrogator, new species. Fig. 24.

The antennæ have the normal structure for *Culex*, but the air tube is short as in *Aedes*. Its pecten is stout and runs to the apical fourth. There are three hair tufts and a fourth smaller, placed laterally. The comb of the eighth segment is in a long straight row, supplemented by a second shorter one. The anal segment is normal. The skin is pilose; the tracheæ broad.

Collected by the junior author at Rincon Antonio, Mexico, in ditches. The adults were named "*Culex? salinarius* Coq." by Mr. Coquillett, with which species they have nothing whatever to do.

Culex barbarus, new species. Fig. 25.

Very nearly allied to *C. cubensis* Bigot, but the air tube much stouter. The lateral hairs are in twos after the second abdominal segment, the subdorsal ones also in twos. Tracheæ broad.

A single specimen was collected by Mr. Busck in a lagoon pool far from habitation on the South coast of Trinidad. It was named "*Culex pipiens* L." by Mr. Coquillett.

Culex bahamensis, new species. Fig. 26.

This very peculiar species was collected by Dr. T. H. Coffin in the Bahamas, but, although he preserved pupæ, he obtained no adults. The skin is glabrous, but curiously enough, the air tube is pilose outwardly. The lateral hairs are in threes on the third and fourth segments, in twos on the fifth and sixth. There are but a single pair of anal gills, a character only paralleled in *Wyeomia*. The six tufts of the air tube are arranged in a line along the posterior margin, three of them within the pecten.

Culex mortificator, new species. Fig. 27.

Antennæ normal, dark throughout; head hairs in threes. Air tube seven times as long as wide, uniformly slightly tapering, the pecten on the basal fourth; tufts very long but few-haired. Comb of the eighth segment of many long spine-like scales in a large patch. Anal segment rather long, normal; anal gills unusually long.

Collected by the junior author in Zent, Costa Rica, in a hollow in a stump of a banana tree, but no adults were obtained.

Culex carmodyæ, new species. Fig. 28.

Antennæ normal, pale at base. Body pilose; lateral hairs in twos after the second segment; subdorsal hairs long and in twos on segments 5, 6 and 7; tracheæ broad. Air tube five to seven times as long as wide with the three tufts in twos, the basal very long, the others successively shorter. Comb of the eighth segment normal, moderate.

Collected by Mr. Busck in San Domingo from a vase in the hotel parlor and in a slowly running water course across a road. The adults were named "*Culex salinarius* Coq." and "*Culex pipiens* L.," neither of which species occurs in the island to our knowledge. We

name the species for Miss Mary Carmody, who has done excellent and faithful work in drawing the mouth parts of larvæ, and is withal a most amiable young lady.

Culex extricator, new species. Fig. 29.

The antennal tuft arises near the middle, but has a distinct notch; the head hairs are in threes or fours; air tube much tapered on outer half, the tufts weak; body shortly hairy, the spicules not much elongated. The lateral hairs are in twos after the second abdominal segment. Lateral comb of the eighth segment well developed. Anal gills bluntly rounded.

Collected by Mr. Busck in a bucket used to keep live crabs at Cedros, Trinidad. The adults were named "*Culex pipens* L." by Mr. Coquillett.

Culex declarator, new species. Fig. 30.

Antennal tuft placed well outward, the member all dark. Head hairs in fours; body pilose; lateral hairs in twos after the second abdominal segment. Air tube five times as long as wide, the pecten reaching one-third. Lateral comb of the eighth segment large; anal gills short and blunt.

Collected by Mr. Busck in a lagoon pool far from habitation on the south coast of Trinidad. The adults were named "*Culex pipiens* L." by Mr. Coquillett.

Culex proclamator, new species. Fig. 31.

Antennal tuft at the outer third, the member dark; head hairs in threes; body pilose; tracheæ broad. The subdorsal hairs of the abdominal segments are very long. Air tube five times as long as wide, strongly tapered outwardly, the apical third nearly straight; pecten very long and running to one-half.

Collected by the junior author at Santa Lucrecia and Almoloya, Mexico; Puntarenas, Costa Rica.

The adults were named "*Culex? salinarius* Coq." and "*Culex? securator* Theob."

Culex inquisitor, new species. Fig. 32.

Antennal tuft well outward, the whole member dark; head hairs in threes; lateral abdominal hairs in twos after the first segment.

Air tube five times as long as wide, the pecten short and reaching nearly to the middle. Anal gills long and pointed.

Collected by Mr. Busck in a manure ditch behind a stable, Cedros, Trinidad, and in pods of cocoa in "stinking black half solid water" in Dominica. The eggs are laid in boats. Also obtained by the junior author in Santa Lucrecia, Mexico and Puntarenas, Costa Rica. All the adults were labelled "*Culex secutor* Theob." by Mr. Coquillett.

Culex salinarius Coquillett.

Culex nigrutilus Smith, Ent. news, xiii, 303, 1902.

Culex nigrutilus Dyar, Journ. N. Y. ent. soc., xi, 24, 1903.

Culex nigrutilus Dyar, Proc. ent. soc. Wash., v, 143, note, 1903.

Culex nigrutilus Smith, Rept. ent. Dept. N. J. Agr. Exp. Sta., 535, 1903.

Culex salinarius Coquillett, Ent. News, xv, 73, 1904.

Culex salinarius Smith, Bull. 171, N. J. Agr. Exp. Sta., 23, 1904.

Culex salinarius Dyar, Journ. N. Y. ent. soc., xii, 173, note, 1904.

Culex salinarius Felt, Bull. 79, N. Y. Sta. Mus., 332, 1904.

Culex salinarius Smith, N. J., Agr. Exp. Sta., Rept. Mosq., 318, 1905.

This species is unfortunately misnamed, for it never lives in salt water. It is a permanent swamp species, often frequenting rain barrels and occurring from the Atlantic to the Mississippi Valley. Our records are Chesapeake Beach, Md. (Dyar), Newark, N. J. (Brehme), Urbana, Ill. (Knab), Washington, D. C., (Dyar), Georgetown, D. C. (Caudell), Springfield, Mass. (Knab), St. Louis, Mo. (Busck).

Culex habilitator, new species. Fig. 33.

Antennæ with the tuft at outer third, all dark. Head hairs, the upper tuft in four or five, the lower in three. Body pilose; lateral hairs in twos after the second abdominal segment; subdorsal hairs in threes on segments 3 to 7. Air tube very long, 8 x 1, the pecten reaching nearly one-third.

The larvæ were collected by Mr. Busck in a small pool in a cave in coral cliffs near the ocean in San Domingo and in a large crab hole in a lagoon along a river, but these last are referred here with doubt as the condition of the skins is imperfect. The specimens were named "*Culex secutor* Theob."

Culex factor, new species. Fig. 34.

Antennal tuft beyond the middle, the member pale on the basal half. Head hairs in threes; body pilose; tracheal tubes broader than

in *coronator*. Lateral hairs in twos after the second abdominal segment. Subdorsal hairs very long and in twos on segments 4 to 7. Air tube long, 6×1 , the pecten reaching to one-third.

Collected by the junior author at Santa Lucrecia, Rincon Antonio, Tehuantepec and Salina Cruz, Mexico, and labelled "*Culex? secutor* Theob." by Mr. Coquillett. Others were taken at St. Vincent, Barbadoes and Martinique by Mr. Busck and labelled "*Culex salinarius* Coq." by the author of that species; but these specimens of Mr. Busck we refer here more doubtfully, as their condition is so poor that we cannot be certain of them. Mr. Busck's material was all taken out and handled by Mr. Coquillett before our final examination, which extra handling was far from beneficial to the skins.

Culex regulator, new species. Fig. 35.

Antennæ with the tuft nearly at the outer third, pale at base. Head hairs in threes; body pilose; lateral hairs in twos after the second abdominal segment; tracheæ broad. Air tube 7×1 , with long single hairs, the pecten reaching to one-fourth. Anal gills long and pointed.

Collected by Mr. Busck in an old bucket in a field in San Domingo. The adults were named "*Culex salinarius* Coq."

Culex pipiens Linnaeus. Fig. 36.

Culex pipiens Linnaeus, Syst. Nat., ed. x, 601, 1758.

Culex pipiens Blanchard, Les Moustiques, 340, 1905.

Antennal tuft at the outer third, the member all dark. Head hairs in fours or more; body glabrous; lateral hairs in twos after the second abdominal segment; subdorsal hairs in twos; tracheæ broad. Air tube about five and a half times as long as wide, the pecten reaching nearly one-third.

We have accepted this form as the common European species introduced into America, although in spite of various efforts we have been unable to secure any European larvæ for comparison. The species is domestic in habits, the larvæ occurring in rain water barrels and other artificial receptacles. The distribution is Northern, but not boreal and is confined to the vicinity of civilization. Our records are: Bellport, N. Y. (Dyar), Ithaca, N. Y. (Johannsen), West Springfield, Mass. (Knab), Durham, N. H. (Dyar), Chicago, Ill. (Kelly),

Urbana, Ill. (Knab), Murphysboro, Ill. (Mosier), Arlington and Rosslyn, Va. (Pergande).

Culex cubensis Bigot. Fig. 37.

Culex pungens Wiedemann (not Desvoidy), Auss. zweifl. Ins., i, 11, 1828.

Culex cubensis Bigot, Hist. fisc. Isl. Cuba, vii, 329, 1857.

Culex fatigans Blanchard (in part), Les Moustiques, 353, 1905.

This is the *Culex pungens* Wied. and is the form called "*Culex fatigans* Wied." by Mr. Theobald and, following him, by Miss Ludlow. We are unable to consider it conspecific with the Indian *fatigans*. In the first volume of his monograph of Culicidæ (pp. 28 and 43), Mr. Theobald quotes a figure of the larva and account of its habits from Capt. James, which evidently refers to a wild long-tubed species, something like our *territans*. Other authors refer to *fatigans* as a domestic species, so it may be that Mr. Theobald did not rightly name Capt. James' material. We have specimens from India labelled *fatigans* which come very near our *cubensis*, yet show enough difference to prevent our putting them under the same name. *Cubensis* appears to be the earliest valid name based on American specimens, of those that have been referred to the synonymy of *fatigans*, and we therefore use the name.

The larva is close to *pipiens*, but has a shorter air tube, 4×1 , and the subdorsal hairs are single. It is a domestic species, but has a southern distribution, overlapping *pipiens* in the northern part of its range only. The junior author collected it in a shallow puddle at Cordoba, in a water barrel at the door of a workman's dwelling and in a trench back of a store in Rincon Antonio; in a hole in a tree trunk at Tehuantepec, Mexico; in a barrel of clear water in a shed at San José; in a boat full of rain water, Port Limon, Costa Rica. Mr. Busck collected it in an earthen-ware vessel of rain water, in an open ditch along a road, in a bucket used to keep live crabs, in an unused chicken feeder in Cedros; in a hollow tree near a house, Montserrat, Trinidad; in an old starch barrel, St. Vincent; in a barrel back of a house, Barbadoes; in a hollow tree, Fort de France; in running water in a horse trough, in running water in the country with green algæ, in a rain water barrel in a negro's house, Martinique; in an old sugar boiler, Dominica; in a water hole in the country, St. Thomas; in an old iron tank, City of San Domingo. We have North American specimens

from Victoria, Texas (Hinds), Baton Rouge, La. (Dupree), and Washington, D. C. (Dyar). The specimens were uniformly determined as "*Culex pipiens* L." by Mr. Coquillett.

Concerning the supposed transference of *Filaria* by this species, we presume it is not necessary for it to be strictly conspecific with the Indian *fatigans* in order to accomplish it, for a number of not closely allied mosquitoes appear to be regarded as carrying agents (compare Blanchard, Les Moustiques, 536, 1905). We would observe that the *Culex skusei* which Col. Giles regarded as the transferring agent of *Filaria* is a good species, not a synonym of *fatigans* as stated by Blanchard, nor even a variety of it as Theobald makes it, to judge from the published figure of the larva. We do not know *skusei* in America.

Culex coronator, new species. Fig. 38.

Antennæ with the tuft slightly beyond the middle, pale; head hairs, the upper in four or five, the lower in three or four, rarely five; body hairy. Air tube long, 9×1 , the pecten reaching two-fifths, a crown of coarse spikes before apex, usually well developed, sometimes nearly obsolete. Anal gills moderate.

An abundant species throughout the tropics, apparently absent from the islands. Mr. Busck took it in a pool in the woods at St. Joseph, Trinidad, in a lagoon pool on the South side of Trinidad, in a bucket with live crabs and an open ditch in the middle of the village, Cedros, Trinidad. The junior author found this the commonest species in Mexico and Central America. The localities are: puddles in street, shallow puddle on outskirt, pools in a stream, Cordoba; muddy road way along railroad tracks, Tehuantepec; puddles, etc., Salina Cruz; tanks at Acapulco, Mexico; puddles, San Jose de Guatemala; ditch, San Salvador; hole in root of tree, Sonsonate, Salvador; shallow pool, Puntarenas, large muddy puddle and barrel of clear water, San Jose, Costa Rica; puddles in freshly dug railroad ditch, Port Limon, Costa Rica. This is a most inoffensive mosquito. Although breeding in myriads in all roadside puddles it seems not to bite and does not enter houses. The adults were all named "*Culex secutor* Theob." by Mr. Coquillett, except one of Mr. Busck's, which was called "*pipiens*" (it may have been in bad condition). To the junior author's specimens he added a query and the note "also *janitor*? and *tarsalis*?"

Culex derivator, new species. Fig. 39.

Antennæ with the tuft well outward; upper head tuft double, very long, body hairy; tracheæ narrow; lateral hairs in twos after the second abdominal segment. Air tube very long, 11×1 , pecten reaching one-third its length, the distal teeth detached; five short tufts on posterior margin. Lateral comb of the eighth segment large, of long spines.

Taken by the junior author in a puddle in a ravine at Cordoba, Mexico, but not bred.

Culex investigator, new species. Fig. 40.

Antennæ with the tuft slightly beyond the middle, dark; head hairs single; body pilose; lateral hairs in twos after the first abdominal segment. Air tube five-and-a-half times as long as wide, rather markedly tapered on basal third; pecten of long teeth, reaching two-fifths, followed by five rather short hair tufts.

Taken by the junior author in a pool beside the railroad track, three miles from town, Santa Lucrecia, Mexico. Mr. Coquillett seems not to have named the adult although one was bred.

Culex inhibitor, new species. Fig. 41.

Antennæ with the tuft near the outer third, dark; upper head tuft of four, short, lower long and single; body hairy; lateral hairs in twos after the first abdominal segment; tracheæ narrow. Air tube long, 6×1 , the pecten long and reaching one-third, with five tufts, decreasing in length a little toward tip. Anal segment long, but the gills short.

Collected by Mr. Busck in a slowly running clear cold spring in the San Francisco Mts. of San Domingo. It was named "*Melanoconion indecorabilis* Theob." by Mr. Coquillett, but that was described from Para, Brazil, and we do not believe it is our species.

Culex mutator, new species. Fig. 42.

Antennæ with the tuft near the outer third, pale at base; upper head tuft of three, lower single; body pilose. Air tube 5×1 , tapered, five or six tufts along the posterior margin, the basal one longest; pecten long, but not immoderately so.

Collected by the junior author at Cordoba, Mexico, in puddles in a

ravine. The adults were named "*Melanoconion humilis* Theob." by Mr. Coquillett, but we see no reason to accept this determination. *M. humilis* was described from São Paulo, Brazil.

Culex elevator, new species. Fig. 43.

Antennæ with the tuft beyond the middle, pale at base; head hairs single; body hairy; two lateral hairs on the second abdominal segment, three on the third to sixth. Air tube 6 x 1, nearly straight with very long pecten; five tufts on the posterior margin; anal gills short.

Taken by the junior author in a pool of clear water containing vegetable debris at the head of a small stream two miles west of Port Limon, Costa Rica. The adults were not bred.

Culex educator, new species. Fig. 44.

Antennæ with the tuft at outer third, dark; head hairs single; body coarsely hairy; lateral hairs in twos on the second segment, in threes on the third to sixth; subdorsal hairs long, stellate; tracheæ narrow. Air tube 6 x 1, a little tapered, pecten moderate; five tufts on the posterior margin decreasing to tip.

Collected by the junior author in an old stream bed disconnected from the stream, containing fish, but the larvæ in reeds at the edge, Río Aranjuez, near Puntarenas, Costa Rica. The adults were named "*Melanoconion atratus* Theob." by Mr. Coquillett.

Culex conspirator, new species. Fig. 45.

As in the preceding species, but differentiated by the characters given in the table.

Collected by the junior author at Almoloya, Oaxaca, Mexico, in a large pot hole full of clear water and in a shallow pool frequented by cattle at Las Loras near Puntarenas, Costa Rica. The specimens were named "*Melanoconion atratus* Theob."

Culex territans Walker.

Culex territans Walker, Ins. Saund., Dipt., i, 428, 1856.

Culex territans Dyar, Journ. N. Y. ent. soc., ix, 178, 1901.

Culex territans Smith, Ent. news, xiii, 302, 1902.

Culex territans Dyar, Proc. ent. soc. Wash., v, 48, 142, 1903.

Culex territans Dyar, Science, n. s., xvi, 672, 1902.

Culex territans Dyar, Proc. ent. soc. Wash., vi, 40, 1904.

Culex territans Smith, Bull. 171, N. J. Agr. exp. Sta., 24, 1904.

Culex territans Felt, Bull. 79, N. Y. Sta. Mus., 307, 1904.

Culex territans Knab, Journ. N. Y. ent. soc., xii, 246, 1904.

Culex territans Smith, N. J. Agr. exp. Sta., Rept. Mosq., 329, 1905.

Culex territans Blanchard, Les Moustiques, 367, 1905.

Our most common species in the Summer time, breeding in all the swamps especially if cold and clear. It seems entirely harmless as we have never been bitten by a specimen. The adult is in fact seldom seen, being of retiring habits. It may be obtained by sweeping the bushes.

The species occurs throughout the United States. We may mention Springfield, Mass. (Knab), Ithaca, N. Y. (Johannsen), Lahaway, N. J. (Brakely), Baltimore, Md. (Dyar and Caudell), Baton Rouge, La. (Dupree), Stanford Univ., Cal. (MacCracken), Kaslo, B. C. (Dyar and Currie).

Culex simulator, new species. Fig. 46.

Antennæ with the tuft at outer third, dark; upper head tuft double, lower single; body smooth; lateral hairs single on the second abdominal segment, double on the third to sixth; tracheæ narrow. Air tube 7×1 , slightly flared at tip, with five tufts on the posterior margin; pecten very long, reaching one-third; lateral comb of the eighth segment scarcely over two rows deep. Anal segment long.

Taken by Mr. Busck in Arima, Trinidad, in the primeval woods. No adults were obtained.

Culex gravitator, new species. Fig. 47.

Antennæ with the tuft before the outer third, dark; hairs single; body glabrous; lateral hairs in threes on abdominal segments 3 to 6; tracheal tubes narrow, angulated within the segments. Air tube six-and-a-half times as long as wide, with long pecten reaching to one-third. Anal gills small.

Collected by the junior author in a large Bromeliaceous plant containing water between the leaves, growing in a thicket in a valley above Cordoba, Mexico. In spite of careful attention no adults were bred. Some of the larvæ lived two months after being collected; they probably died of starvation.

Culex decorator, new species. Fig. 48.

Antennæ with the tuft beyond the outer third, dark; head hairs, the upper tuft triple, the lower single; lateral hairs double on the second

segment, in threes on the third to fifth, in twos and much longer on the sixth. Air tube 7 x 1, the pecten not reaching one-third, short. Anal gills short.

Collected by Mr. Busck on Tobago Island, the larvæ in bamboo joints. They were brought to Washington alive, but failed to mature.

Culex tarsalis Coquillett.

Culex tarsalis Coquillett, Can. ent., xxviii, 43, 1896.

Culex kelloggii Theobald, Can. ent., xxxv, 311, 1903.

Culex tarsalis Dyar, Proc. ent. soc. Wash., vi, 40, 1904.

Stegomyia (?) *tarsalis* Blanchard, Les Moustiques, 265, 1905.

We have the species from three widely separated localities, Stanford University, Cal. (MacCracken), Victoria, B. C. (Dyar), Urbana, Ill. (Knab). The larvæ differ perceptibly; especially the Californian ones have a shorter, darker air tube and a thicker labial plate; but we do not esteem the differences to be of specific value.

Culex secutor Theobald. Fig. 49.

Culex secutor Theobald, Mon. Culic., ii, 321, 1901.

Culex secutor Blanchard, Les Moustiques, 300, 1905.

Culex secutor Dyar, Journ. N. Y. ent. soc., xiii, 26, 1905.

Dr. Grabham has kindly sent us the larvæ from Cinchona, Jamaica. They represent a distinct species, which has not come to us from any of the other islands or the mainland.

Culex lamentator, new species. Fig. 50.

Antennæ with the tuft but slightly beyond the middle, dark; head hairs in threes; body granular, subspicular; lateral hairs in twos after the first segment; tracheæ broad. Air tube 6 x 1, with six tufts along posterior line; pecten reaching a little over one-fourth. Lateral comb of the eighth segment large; gills moderate.

Collected by Mr. Busck in a hollow palm trunk in the San Francisco Mts., San Domingo. It was named "*Culex secutor* Theob." by Mr. Coquillett; it should be regarded as a distinct, but allied species, representing the Jamaican form in San Domingo.

Culex microsquammosus Theobald.

Culex microsquammosus Theobald in Grabham, Can. ent., xxxvii, 407, 1905.

Dr. Grabham gives the larval characters in presenting Mr. Theobald's description. The species is from Jamaica.

Culex atratus Theobald.

Culex atratus Theobald, Mon., Culic., ii, 55, 1901.

Melanoconion atratus Grabham in Theobald, Mon. Culic., iii, 238, 1903.

Culex atratus Blanchard, Les Moustiques, 335, 1905.

Melanoconium atratum Blanchard, Les Moustiques, 395, 1905.

Melanoconion atratus Grabham, Can. ent., xxxvii, 403, 1905.

The larva has been made known by Dr. Grabham. His first communication is accompanied by a plate (Mon. Culic., iii, pl. xvi) which, however, gives no adequate idea of the species, so that the senior author was led to accept one of Mr. Coquillett's determinations, and published a description of another larva under this name. (See Journ. N. Y. ent. soc., xiii, 29, 1905, and compare *Mochlostyrax erraticus* of this paper).

Culex carcinophilus, new species. Fig. 51.

Antennæ with the tuft beyond the middle, dark; upper head tuft multiple, lower single; body spicular, not pilose; lateral hairs in twos on the second abdominal segment, in threes on the third to sixth. Air tube very long, 10 x 1, straight; four small, two-haired tufts on posterior margin; pecten of long spines outwardly, reaching to one-sixth. Lateral comb of the eighth segment large; anal gills very small.

Collected by Mr. Busck from crab holes containing fresh water near San Domingo City. The adults were named "*Melanoconion atratus* Theob."

Culex daumasturus, new species. Fig. 52.

Distinct from any known larva by the very long air tube (12 x 1) with a swelling at the outer third.

It was collected by Mr. Busck in the leaf corner of a Century Plant near the pitch lake, La Brea, Trinidad. A second specimen has been sent us by Mr. Urich from Bromelias at Arima, Trinidad. The adult was named "*Culex imitator* Theob." by Mr. Coquillett, and it may be that species, which was bred from Bromelia water by Dr. Lutz in Brazil; but we do not feel certain enough of it to accept the name.

Culex vector, new species. Fig. 53.

Antennæ with the tuft at the outer third, pale; body glabrous; lateral abdominal hairs in four on first segment, twos on second, fours

on third to fifth, single and long on the sixth. Air tube 9×1 , wide at base, the pecten sparse and long, reaching to one-fourth, followed by a little double-haired tuft. Lateral comb of the eighth segment a large patch of long spines. Anal gills moderate, pointed.

Collected by Mr. Urich in Trinidad from Bromelia water. It was named by Mr. Coquillett "*Culex varipalpus* Coq.," but on our remonstrating with him, it was changed to "*Culex imitator* Theob." We cannot adopt this name, either. (See remark under the preceding species).

Culex rejector, new species. Fig. 54.

Antennæ with the tuft near the outer third, pale; head hairs, the upper tuft multiple, the lower single; body glabrous; lateral hairs in twos on segments 2 to 5, single on the sixth; tracheal tubes narrow, angled. Air tube very long, 10×1 , nearly straight, with four small tufts on posterior margin; pecten of very long spines to one-fifth. Lateral comb of the eighth segment of long spine-like scales. Lateral tuft of the anal segment very large; gills long and pointed.

Collected by the junior author in a large Bromeliaceous plant at Cordoba, Mexico, with *C. gravitator*. All these larvæ died, presumably from lack of their natural food.

Culex inimitabilis, new species. Fig. 55.

Collected in Bromelia water by Mr. Urich in Trinidad with *C. daumasturus*, which it resembles, but lacks the swelling on the tube. The body is smooth; the lateral hairs are in threes on the first segment, twos on the second, threes and short on the third to fifth, twos and long on the sixth. It was named "*Culex? pipiens* L.," by Mr. Coquillett; rather a worse guess than usual.

Culex conservator, new species. Fig. 56.

Antennæ with the tuft beyond the outer third, dark; air tube 8×1 , a single hair at the middle; pecten not reaching one-third. Anal segment long with short gills.

Collected by Mr. Busck in a hollow tree in the village of St. Joseph, Trinidad. Also in hollow trees near Montserrat, Trinidad, and Fort de France, Martinique, but these are broken and we do not feel sure of them. All were labelled "*Aedes perturbans* Will." by Mr. Coqu-

illett. Blanchard refers *perturbans* Will. to the genus *Wyeomia* (Sabethinæ) and makes it the same as *W. grayii* Theob. Apparently nobody knows what Williston's species really was; it may be our *C. conservator* or *C. divisor* or some other species, more probably the latter, we believe.

Culex restrictor, new species. Fig. 57.

Antennæ with the tuft near the outer third; upper head hair triple, lower single, long; lateral hairs in twos on the second to sixth abdominal segments. Air tube 8 x 1, the pecten to one-fifth; four single hairs on posterior margin. Lateral comb of the eighth segment large; anal gills small.

Collected by the junior author in a small hole in a tree in a ravine at Almoloya, Oaxaca, Mexico. Our larva pupated, but failed to emerge.

Culex latisquamma Coquillett. Fig. 58.

Tinolestes latisquamma Coquillett, Proc. ent., soc. Wash., vii, 185, 1906.

Antennal tuft at the outer third, dark; upper head tuft four, lower single; lateral hairs in four on the first segment, two long ones on the second, in twos but short on the third to fifth, one long one on the sixth. Air tube 8 x 1, pecten to one-third.

Collected by the junior author at Port Limon, Costa Rica, with *Deinocerites* in crab holes. The larvæ were not bred, although they lived a month and were brought back to Washington. Adults captured in the hole, which are in all probability adults of these larvæ, were named "*Aedes? nigricorpus* Theob." by Mr. Coquillett and later described as a new genus and species.

Culex divisor, new species. Fig. 59.

The characters are included in the table, all that can be demonstrated in the rather badly damaged material, which suffered in transit.

It was collected by Mr. Urich in Trinidad; ten specimens were bred from the same egg mass collected in a hollow bamboo joint. The egg mass was floating free, the eggs stuck together by their sides in the normal way. Mr. Coquillett has identified the adults as "*Aedes pertinans* Will.," which may be correct. The species *pertinans* has, however, been referred to the Sabethinæ, and we do not feel justified in accepting the same till someone has examined Williston's types.

Mr. Coquillett's results, especially in the genus *Culex*, have produced in our minds a feeling of most profound distrust, and we are not prepared to accept anything that he says without corroboratory evidence.

Genus MOCHLOSTYRAX, new.

Differs from *Culex* in the structure of the comb of the eighth segment, which consists of a single row of bars instead of a patch of scales. We had thought to call this genus *Melanoconion* Theob., but the type species of that genus is *atratus* Theob., of which the larva has been made known by Dr. Grabham (in Theobald, Mon. Culic., iii, 238, 1903 and Can. ent., xxxvii, 404, 1905). In neither place is the structure of the comb accurately stated, but it is said to consist of "numerous flattened elongate scales bordered with fine setæ." It is clear that no one would so describe a row of bars, and the species *atratus* must be referred as a typical *Culex* of that group that has a very long slender tube. Type, *M. caudelli*, new species.

Table of species.

- | | |
|--|------------------|
| 1. Antennæ with the tuft at the middle, slight; tube with 15 hair tufts along the posterior line..... | <i>urichii</i> |
| Antennæ with the tuft from a notch beyond the middle..... | 2 |
| 2. Air tube over four times as long as wide, slender, scarcely tapered, with slight terminal setæ | 3 |
| Air tube not over four times as long as wide, stout at base and tapering, slightly curved forward with two stout hooks at tip..... | 4 |
| 3. Bars of comb in a perfectly regular row, body glabrous..... | <i>melanurus</i> |
| Bars of comb in an irregular row, body pilose..... | <i>erraticus</i> |
| 4. Bars of comb in a curved row; body pilose..... | <i>pilosus</i> |
| Bars of comb in a straight row; body glabrous | 5 |
| 5. Comb of sixteen bars | <i>caudelli</i> |
| Comb of only eight bars..... | <i>cubensis</i> |

Mochlostyrax urichii Coquillett. Fig. 60.

Melanoconion urichii Coquillett, Can. ent., xxxviii, 61, 1906.

We have the larvæ from Mr. Urich from Trinidad, who says: "Often found associated with *Mansonia facipes* and occurring under the same conditions. Predominating color brown. During life the similarity of the two larvæ is marked."

Mochlostyrax melanurus Coquillett.

Culex melanurus Coquillett, Journ. N. Y. ent. soc., x, 193, 1902.

Culex melanurus Dyar, Journ., N. Y. ent. soc., x, 196, 1902.

Culex melanurus Dyar, Proc. ent. soc. Wash., v, 143, 1903.

Culex melanurus Dyar, Science, n. s., xvi, 672, 1902.

Culex melanurus Felt, Bull. 79, N. Y. Sta. Mus., 337, 1904.

Melanoconion melanurus Dyar, Journ. N. Y. ent. soc. xiii, 28, 1905.

Culex melanurus Smith, N. J. Agr. exp. Sta., Rep. Mosq., 322, 1905.

Occurs in the northern Atlantic States; we have it from New Hampshire, New York and New Jersey. The fully grown larva hibernates, which is the only known instance of such a habit.

Mochlostyrax erraticus, new species. Fig. 61.

The larva resembles that of *Culex salinarius*. The skin is densely covered with minute spiculæ, making it appear pilose. The air tube is long and straight, about six times as long as wide, has the pecten small, running to the basal third, followed by five moderate tufts on the posterior edge and two very short dorsal ones. The lateral comb of the eighth segment has the spines in a rather irregular row, not in the normal perfectly straight line, yet not doubled. We have the species from Dr. Dupree, Baton Rouge, Louisiana. It was identified as "*Melanoconion atratus* Theob." by Mr. Coquillett, but of course erroneously.

Mochlostyrax pilosus, new species. Fig. 62.

The upper epistomal hair is double, the lower single, the anteantennal tuft of four. Air tube straight along the front side, curved behind, the pecten not reaching one-half, composed of long spines; eight hair tufts on the posterior edge, the two within the pecten very long, the others shorter. Comb of the eighth segment of 15 thorn-shaped scales in a curved row.

The specimens were collected by the junior author in Santa Lucracia, Mexico, in cattle tracks filled with water in the edge of a swamp. They have the habit of lying on the back at the bottom. The adults were named "*Melanoconion atratus* Theob." by Mr. Coquillett.

Mochlostyrax caudelli, new species. Fig. 63.

The upper epistomal tuft has three hairs, lower three, the small tuft below eight hairs, the anteantennal tuft five hairs. Air tube straight or slightly concave before, curved behind, with a pair of hooks at the tip. Pecten very long, not reaching half way along the tube, seven tufts on the posterior edge, the two within the pecten

longest, the rest successively shorter; a single tuft on the side of the tube. Comb of sixteen bar-like spines in a straight row. Anal segment with complete chitinous ring, the gills very long, tapered. The body is without spicules.

Mr. Busck collected the specimens in a rather large pool in a palm swamp far from civilization at Arima, Trinidad. He says: "the larvæ are weakly looking small fellows, which lie on their backs with jaws upward and open. They feed on very minute animal life (Crustacean) which abounds in these pools; observed this habit both in nature and in captivity and bred so few (five specimens) because the rest died when the Crustaceans gave out."

The adults were named "*Melanoconion atratus* Theob." by Mr. Coquillett. We have it for Mr. A. N. Caudell, our friend and co-worker.

Mochlostyrax cubensis, new species. Fig. 64.

The specimens are badly damaged, but enough is left to give the specific characters. The tube is of the same shape as in *caudelli* and had apparently similar hair tufts. Pecten very long, not reaching half way along the tube. Lateral comb of the eighth segment of eight bars, stout, well separated, the upper ones smaller.

We have the specimens from Havana, Cuba, from Mr. John R. Taylor as "*Melanoconion atratus* Theob." the determination made by Mr. Coquillett, we believe.

Subfamily SABETHINÆ.

Table of genera.

- | | |
|---|---------------------|
| 1. No lateral comb on the eighth segment..... | <i>Joblotia</i> |
| Lateral comb present on the eighth segment..... | 2 |
| 2. Air tube spicular; maxillæ heavily armed, raptorial..... | 3 |
| Air tube smooth; maxillæ without heavy armature, not raptorial..... | <i>Wyeomyia</i> |
| 3. Head normal, the mouth parts not visible from above..... | <i>Sabethoides</i> |
| Mandibles and maxillæ visible from above..... | <i>Lesticocampa</i> |

Genus JOBLOTIA Blanchard.

Trichoprosopon Theobald (not *Trichoprosopus* Macquart), Mon. Culic., ii, 283, 1901.

Joblotia Blanchard, Cont. rent. heb. Soc. Biol., liii, 1045, 1901.

Joblotia niveipes Theobald. Fig. 65.

Trichoprosopon niveipes Theobald, Mon. Culic., ii, 285, 1901.

Joblotia niveipes, Blanchard, Les Moustiques, 429, 1905.

Joblotia niveipes Goeldi, Os Mosq. no Para, 120, 1905.

Prof. Goeldi has described and figured the larvæ from Brazil. He found them in the water in the leaves of Bromelias, in the axils of banana leaves and in holes in fallen trees. The species is distributed throughout the moist tropics. Mr. Busck collected larvæ in Trinidad from cacao husks and the junior author found them in cocoanut shells and cacao husks at Puntarenas, Costa Rica, and Sonsonate and Izalco, Salvador. The water in which they occur is very dirty, of a thick consistency. The eggs are laid in rafts, erect as in *Culex*, but of circular outline, not elliptical. Larvæ which were brought home lived for four months in the laboratory, perhaps delayed in development by the absence of their natural rich food.

Genus SABETHOIDES Theobald.

Sabethoides Theobald, Mon. Culic., iii, 328, 1903.

Sabethoides Blanchard, Les Moustiques, 423, 1905.

We are not acquainted with the larva of the typical species of this genus (*confusus* Theob.), but use the name on the supposition that *undosus* Coq. has been correctly referred generically.

Sabethoides undosus Coquillett. Fig. 66.

Sabethoides undosus Coquillett, Proc. ent. soc. Wash., vii, 186, 1906.

We have the larvæ from Mr. Urich in Trinidad, who got them in bamboo joints in St. Ann's Valley. Mr. Busck also collected them and observed that they were predaceous, as is obvious from the structure of the maxillæ.

Genus *Lesticocampa*, new.

Differs from all the other Sabethid larvæ by the remarkably developed mouth parts; the maxillary palpi are much like the antennæ in size and shape; the maxillæ are very large and project twice as far as the antennæ. Type, *L. lunata* Theob.

Lesticocampa lunata Theobald. Fig. 67.

Wyeomyia lunata Theobald, Mon. Culic., ii, 279, 1901.

Joblotia lunata Theobald, Mon. Culic., iii, 336, 1903.

Described from Brazil. Our larvæ are from Mr. Urich in Trinidad. He got them in Arima, in Bromelia water. They are probably

predaceous on the other larvæ living in the Bromelia leaves. The identification is by Mr. Coquillett; we have no means of checking it.

Genus WYEOMYIA Theobald.

Wyeomyia Theobald, Mon. Culic., ii, 267, 1901.

Limatus Theobald, Mon. Culic., ii, 349, 1901.

Simondellea Laveran, in Simond, C. rend. heb. Soc. Biol., liv, 1158, 1902.

Phoniomyia Theobald, Mon. Culic., iii, 311, 1903.

Dendromyia Theobald, Mon. Culic., iii, 313, 1903.

Table of species.

1. Anal processes two, the upper pair aborted..... 2
Anal processes equally developed..... 3
2. Tube and plate without basal infuscation..... *smithii*
Tube and plate with heavy black basal ring..... *asullepta*
3. Lateral comb of the eighth segment of six separate teeth..... *durhami*
Lateral comb of the eighth segment of many teeth in a long line..... 4
4. Comb a long row of single teeth, nowhere doubled..... 5
Comb of teeth in a band, at least in part two rows deep..... 7
5. Tube with delicate scattered tufts, dark with pale tip..... *grayii*
Tube with coarse single hairs, all pale..... 6
6. Air tube $3\frac{1}{2} \times 1$; spines of comb scales shorter than the base *ochrura*
Air tube 5×1 ; spines of comb scales longer than the base *telestica*
7. Tube with short spines resembling pecten..... 8
Tube without false pecten..... 9
8. Pecten of the air tube 3 spines preceded by a hair..... *ulocoma*
Pecten of the air tube without preceding hair..... *autocratica*
9. Tube strongly tapered outwardly; tube and plate without black ring.
longirostris
Tube straight, tapered only near tip; tube and plate with back basal
ring..... *aporonoma*
10. Tube and plate with black basal ring; subventral tuft short.... *aporonoma*
Tube and plate without black ring; subventral tuft long..... *hemisagnosta*

Wyeomyia smithii Coquillett. Fig. 68.

Culex pungens Smith, (not Wiedemann), in Howard, Mosq., 83-90, 1901.

— — — Smith, Ent. news, xii, 93, 125, 1901.

Aedes fuscus Smith, (not Osten-Sacken), Ent. news xii, 189, 220, 1901.

Aedes smithii Coquillett, Can. ent., xxxiii, 260, 1901.

Aedes smithii Smith, Ent. news, xii, 254, 1901.

Aedes smithii Dyar, Journ. N. Y. ent. soc., ix, 178, 1901.

Aedes smithii Smith, Journ. N. Y. ent. soc., x, 10, 1902.

Aedes smithii Dyar, Proc. ent. soc. Wash., v, 51, 1902.

Aedes smithii Johannsen, Bull. 68, N. Y. Sta. Mus., 426, 1903.

Verrallina ? *smithii* Theobald, Mon. Culic., iii, 295., 1903.

Aedes smithi Felt, Bull. 79. N. Y. Sta. Mus., 341, 1904.

Aedes smithi Blanchard, Les Moustiques, 403, 1905.

Wyeomyia smithi Dyar, Journ. N. Y. ent. soc., xiii, 23, 1905.

Wyeomyia smithi Smith, N. J. Agr. exper. sta. Rept. Mosq., 315, 1905.

Wyeomyia smithi Mitchell, Can. ent., xxxvii, 332, 1905.

The larvæ occur in the leaves of the pitcher plant, *Sarracenia purpurea*, wherever that grows. This is its only place of occurrence; the record from Bromelia leaves in Florida, made by Mr. Coquillett, is obviously erroneous. That is some other species which we hope will be collected again.

Wyeomyia asullepta Theobald. Fig. 69.

Dendromyia asullepta Theobald, Mon., Culic., iii, 315, 1901.

Dendromyia asullepta Blanchard, Les Moustiques, 426, 1905.

Described from Guiana. We have the larvæ from Mr. Urich in Trinidad. The determination seems plausible and we have not rejected it.

Wyeomyia durhami Theobald. Fig. 70.

Limatus durhami Theobald Mon. Culic., ii, 350, 1901.

Simondella curvirostris Laveran, in Simond, C. R. heb. Soc. Biol., liv, 1158, 1902.

Aedeomyia curvirostris Neveau-Lemaire, Mem. soc. zool. France, xv, 223, 1902.

Limatus durhami Blanchard, Les Moustiques, 429, 1905.

Limatus durhami Goeldi, Os Mosq. no Para, 122, 1905.

Prof. Goeldi found the larvæ in water in the forest, rich in detritus of leaves and flowers. Mr. Busck got them in Trinidad in a hollow tree, in a broken cacao shell with *Joblotia*, in a thick rotten fluid, and in a broken rotten Calabash-fruit in the forest far from civilization. Mr. Urich also sent us the species from Trinidad. The junior author collected them at Sonsonate and Izalco, Salvador; Puntarenas, Esparta and Port Limon, Costa Rica. They were in cacao husks. The species is evidently widely spread in the moist tropics.

Wyeomyia grayii Theobald. Fig. 71.

Wyeomyia grayii Theobald, Mon. Culic., ii, 235, 1901.

Wyeomyia perturbans Blanchard, Les Moustiques, 424, 1905.

Described from Jamaica. Our larvæ were taken by Mr. Busck in Trinidad, Tobago Island and San Domingo, in a hollow tree, bamboo stalk and Bromelia leaves. Prof. Blanchard refers the name as a synonym of *Aedes perturbans* Williston; but Mr. Coquillett has made

an entirely different identification of *perturbans*. We accept the name *grayii* for our larva tentatively (see remarks under the following species).

Wyeomyia ochrura, new species. Fig. 72.

The air tube is pale, with concolorous tip, with coarse single hairs. Pecten teeth of the comb of the eighth segment simple. Subventral tuft of the anal segment, large and stellate; lateral hair single. Abdominal hairs tufted. Mr. Busck collected the larva at San Domingo, in the leaf stalks of young palms; it was named "*Dendromyia* sp." by Mr. Coquillett. We have it also from Mr. Urich in Trinidad, named "*Phoniomyia longirostris* Theob." and from Surgeon W. Campbell in Dominica named "*Wyeomyia grayii* Theob." What it would have been named the next time it occurred, we do not know, as we propose to fix it now by a name of its own.

Wyeomyia ulocoma Theobald. Fig. 73.

Dendromyia ulocoma Theobald, Mon. Culic., iii, 313, 1903.

Dendromyia ulocoma Blanchard, Les Moustiques, 426, 1905.

Described from Guiana. We have it from Mr. Busck's collecting in Trinidad and San Domingo. The larvæ occurred in the flower sheaths of wild *Canna*, where there is very little water and that of a slimy nature. There is but a narrow space between the sheath and bud for the larvæ to live in. The eggs are laid singly, but in large numbers in the uppermost, just opening flower. They are elliptical and black. We have nothing to urge against the determination, nor in its favor either. The species is evidently a very specialized one.

Wyeomyia longirostris Theobald. Fig. 74.

Wyeomyia longirostris Theobald, Mon. Culic., ii, 275, 1901.

Wyeomyia trinidadensis Theobald, Mon. Culic., ii, 277, 1901.

Phoniomyia longirostris Theobald, Mon. Culic., ii, 311, 1903.

Phoniomyia longirostris Blanchard, Les Moustiques, 425, 1905.

Described from Brazil and recorded from Trinidad. Mr. Busck got the larva in Tobago Island in the base of a leaf of *Bromelia*. Mr. Urich has sent it to us from Trinidad. The air tube is stout, strongly tapered outwardly, pale with single stout feathered hairs. The anal segment has the subventral tuft short and stellate, the lateral

tuft two-haired. Pecten of the eighth segment of very long fringed teeth. The identification seems plausible and we have therefore accepted it.

Wyeomyia aporonoma, new species. Fig. 75.

The air tube is pale, straight, tapered only near tip, with scattered single hairs. Lateral comb of the eighth segment of scales in a broad band, beginning above in single teeth, then a double row below, the teeth smaller. Anal segment with the subventral tuft small and stellate. Anal plate and tube with a black basal border. Body hairs fine, stellate.

The junior author got the larvæ at Sonsonate and San Salvador, Salvador; Santa Lucrecia, Mexico; Port Limon, Costa Rica. They were in cocoanut shells, a hollow in a stump of a banana tree and cacao shells. The species was named "*Dendromyia? quasiluleoventralis* Theob." but we have been averse to adopting a name so doubtful.

Wyeomyia telestica, new species. Fig. 76.

The larva is allied to *W. ochrusa* D & K, described above. It was sent to us by Mr. Ulrich from Trinidad, bred from Bromelia water. The adults were named "*Dendromyia quasiluleoventralis* Theob." by Mr. Coquillett.

Wyeomyia autocratica, new species. Fig. 77.

This species is allied to *W. longirostris* Theob., but differs markedly in the structure of the tube and comb. The tube bears a false pecten as in *W. ulocoma* Theob. but otherwise these larvæ are not much alike. The specimen was received from Mr. Ulrich in Trinidad, bred from Bromelia water with the preceding. Mr. Coquillett did not find the adult different from the foregoing species.

Wyeomyia hemisagnosta, new species. Fig. 78.

Allied to *W. aporonoma* D & K, but entirely without the broad black margin of the anal plate; the subdorsal abdominal hairs are long in twos and threes, while they are short, stellate tufts in *aporonoma*. They were collected by the junior author at Sonsonate, Salvador, in cacao shells, associated with *Aedes cyaneus* and *W. durhami* and at Port Limon, Costa Rica.

JOURNAL
OF THE
New York Entomological Society.

EDITED BY HARRISON G. DYAR.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

EDITORIAL.

The article which comprises the present issue was first published as author's separates on March 14, 1906. The new species described in it should be credited with that date. It is, perhaps, advisable to mention that this paper was not "distributed by the Government" as has been erroneously stated in print (*Ent. News*, XVII, 181, 1906).

We note the formation of the "Entomological Society of America," having been formed at the Philadelphia meeting of the Entomological Club of the American Association for the Advancement of Science. This appears to be a new society, not a new name for the Entomological Club. We fail to see any necessity for this organization, or any special purpose in its formation. No place of meeting is mentioned, and it must either meet in some later selected place, in which case it will only uselessly compete with the local society there, or meet with the American Association for the Advancement of Science, to uselessly compete with the Entomological Club. No mention of a publication appears with the prospectus, and we heartily hope none will be attempted. None of the present entomological societies are able to pay for their publications out of their subscriptions, except "Entomological News," so that a reduction in the number of publishing societies would seem to be in order, rather than an increase. The American entomologist is a rather rare species, and the number of

journals he has to purchase, to keep up to date, is already too great. Unless the Entomological Society of America can absorb one or more of the existing societies, we think its formation not only useless, but ill-advised.

A recent article by Mr. Witmer Stone (*Science*, n. s., xxiv, 560, 1906), brings forward again the question of determining the types of genera by the first species method. The article favors the method and is in accordance with our own views. We hope that the International Zoölogical Congress will consider this question at its meeting next summer and, if possible, adopt the principle. A question of nomenclature, which we have not seen discussed, and which our codes do not cover, is the matter of the identification of type species. This is equally pertinent by the elimination method of fixing types or any other method. If (by any method) a type is found for a genus, the question arises as to what that species was. The author may have mentioned an old species. Is the type of the genus the old species mentioned, or is it the species the author had before him under that name, perhaps a very different species, misidentified? There ought to be a rule to solve such cases.

BOOK NOTICE.

Entomology, with Special Reference to its Biological and Economic Aspects. By JUSTUS WATSON FOLSOM, Sc.D. Philadelphia, P. Blakiston's Son & Co., 1906.

This book makes a distinct departure from our usual text-books on entomology, in that classification and taxonomy are reduced to a minimum, their place being taken by a general account of the structure and histology of insects, with their habits, adaptations, and the many interrelations that the subject suggests. It is interesting reading to even advanced students and a mine of information to the beginner. We commend the work heartily. It should be read in conjunction with some other work dealing more fully with classification.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF MAY 16, 1905.

(Continued from Vol. XIV, p. 112.)

Mr. Roberts made some remarks on the Haliplidæ and exhibited his collection in this family. He stated among other things that this family had been in more or less confusion for years and no good structural characters had been found to differentiate the species or to separate the males from the females. After considerable investigation he had noted that there was great variance in the shape and character of the prosternal process in the different species and also in the males the second and third joints of the front tarsi were enlarged or flattened and these joints were in some cases lobed, excavated or tuberculated while in the females these joints were simple. He had found that the shape of the coxal plates was to be depended upon as a good character in connection with the sexual characters referred to above. He briefly spoke of the distinguishing characters of several species and discussed their habits.

Mr. Davis exhibited several interesting insects chiefly Orthoptera from the Pine Barrens of New Jersey among which were: *Conocephalus caudellianus* Davis taken in an overgrown cranberry bog and closely resembling *C. robustus*; *Conocephalus nebrascensis* Bruner which is not in Smith's List of New Jersey Insects and, so far as he was aware, has never been reported east of the Mississippi Valley; *Orchelimum erythrocephalum* Davis which resembles *O. vulgare* but having a very red face and head; *Ophiogomphus johannus* Needham, a dragon-fly, new to the List of New Jersey Insects, collected at Hewitt, N. Y., in June; *Ophiogomphus rupinsulensis* collected in Northern New Jersey near Suffern, N. Y.; *Axion tripustulatum*, a coccinelid beetle found at Lakehurst, N. J., on post oaks (*Quercus minor*) that had been attacked by the scale insect *Kermes pubescens*. This scale insect seemed to be also an addition to the New Jersey List.

MEETING OF JUNE 6, 1905.

Held at the American Museum of Natural History. The Vice-president, C. W. Leng, presided with seven members present.

On motion of Mr. Watson, Dr. Love was elected to succeed Mr. Brues as a member of the Publication Committee.

Mr. Joutel stated that he wished to place on record the capture of *Merium proteus* Kirby, a longicorn beetle new to New Jersey.

Mr. Groth remarked that he had noticed the copulation of the males of *Rhyssa lunator* and *atrata* with the females before the emergence of the latter from the tree.

Mr. Davis exhibited live specimens of *Elaprus ruscarius* which had a pronounced stridulation.

Mr. Bueno exhibited a specimen of *Ranatra* which stridulates with its legs.

MEETING OF OCTOBER 3, 1905.

Held at the American Museum of Natural History, with seven members present. In the absence of the President and Vice-President, Mr. Harris presided.

The regular order of business was suspended on motion and Mr. Davis proposed Professor W. M. Wheeler, of the American Museum, as an active member.

Dr. Horn's recent paper on the Cicindelidae in the Deutsche Ent. Zeitung was discussed by Mr. Harris and Mr. Schaeffer.

MEETING OF OCTOBER 17, 1905.

Held at the American Museum of Natural History with twelve members and three visitors present. Mr. Roberts in the chair.

On motion the Secretary cast one ballot for the election of Professor Wheeler as an active member of the Society.

Rev. R. E. Brown was proposed by Mr. Groth as a corresponding member.

The President announced that he had accepted the resignation of Mr. Bueno from the field committee.

Mr. Schaeffer exhibited a few species of Cicindelidae with the following remarks on some of the species:

According to Dr. Horn *Cicindela viridisticta* does not occur in our fauna; the species standing under this name in our lists is *C. arizonensis* which was described by Bates from material collected in southern Arizona by Morrison. The specimen shown by Mr. Schaeffer was one of Morrison's catch. *C. wickhami* is very near *arizonensis* and *viridisticta* and very likely still stands in some collections as *viridisticta*. A few specimens of a variety of *hamorrhagica* seemingly common in southwestern Utah which comes very close to the variety *arizone* as well as a fine series of *oregona* from southeastern Utah ranging from brown to dark blue were exhibited; one of the specimens of the series being very close to Casey's *depressuta* and another almost Leng's *maricopa*. A few specimens of *C. obsoleta* var. *santa clarae* were taken in southern Arizona this year. The typical form is bright green with the middle band and humeral and apical lunules broken up into more or less rounded spots. One of the specimens had the markings entire and connected at the side margin; another specimen was one of the purple colored varieties mentioned by Bates under his description of *C. santa clarae*; this specimen had the markings typical, but in addition, a small white line between the middle band and humeral lunule. *C. santa clarae* occurs on the plains near the foothills of the Huachuca Mountains. It is a strong flier and can be considered rare as only a few specimens were taken. Three specimens of the very rare *Amblychila baroni* were exhibited which were captured under large stones in a somewhat shaded but not moist situation.

Mr. Barber read an account of the summer's experience collecting in the Huachuca mountains with Messrs. Beyer and Schaeffer. He gave a description of mountains, climate and people and mentioned the general results of the collecting and closed with an account of the more common plants and animals found there.

MEETING OF NOVEMBER 21, 1905.

Held at the American Museum of Natural History. President C. H. Roberts in the chair with ten members and three visitors present.

The Librarian, Mr. Schaeffer reported the following additions to the Library: Zeitschrift für Wissenschaftliche Insekten-biologie, Vol. I, Nos. 5-11.

- Museum of the Brooklyn Inst. of Arts and Sciences, Report for 1904.
Entomol. Bericht. Nederlandsche Entomologische Ver., 1904, Nos. 19 and 20; 1905, Nos. 21-24.
Wiener Ent. Zeit., Vol. XXIV, Nos. 5-10.
Canadian Entomologist, Vol. XXXVII, No. 11.
Aquatic Nematocerus Diptera II; by O. A. Johannsen, 1905.
1st and 2d Rep't Entomologist of Montana, December, 1903, 1904.
Proc. Amer. Philos. Soc., Vol. XLVI, Nos. 179-180.
Deutsche Entomol. Zeitschrift, 1905, No. 2.
Zool. Record, Vol. XLI, 1904; Insects by Dr. Sharp.
Berliner Entom. Zeitschrift, Vols. XLVII, Nos. 1-4; XLVIII, Nos. 1-4; XLIX, Nos. 1 and 2; XLV, Nos. 3 and 4.
Bull. de la Soc. Imperiale des Natur., 1904, No. 4.
Verhandl. d. K. K. zool. bot. Gesellschaft Wien, Vol. LV, Nos. 7 and 8.
The Rumford Fund of the American Acad. of Arts and Sciences, 1905.
Anales del Museo Nacional de Buenos Ayres, Tome IV, Ser. III, 1905.
The Insect world, Gifu, Japan, Vol. IX, Nos. 5-9.
Proc. Amer. Acad. Arts and Sciences, Vol. XLI, Nos. 3-7.
Proc. U. S. Nat. Museum, Vol. XXIX, Nos. 1416, 1417, 1419, 1420, 1421, 1423, 1424.

Rev. R. E. Brown was elected a corresponding member on motion of Mr. Joutel.

Mr. Davis proposed Mr. Alfred C. Burrill, 317 West 56th st., as an active member.

The resignation of Mr. Ludwig Riederer as an active member was accepted with regret.

Mr. Schaeffer exhibited a few of the rarer or new species of Coleoptera taken this year in the Huachuca Mountains of Arizona, also a new *Oncideres* from Texas and *Oncideres irroratus* taken by Professor Snow in southern Arizona, which is new to the United States.

Mr. Leng read a paper on "Collecting in the Adirondacks." He described the localities in the vicinity of Mt. Marcy and Whiteface, referring especially to the great accumulation of decayed trees and the deep damp moss found near the summits of those mountains. He also described the mid-day flight of insects of all orders, but especially Coleoptera, noticed in July at the rocky top of Whiteface Mountain, the insects being apparently carried unwillingly to the top by the air currents. Mr. Barber said that he had observed the same flight at the top of Mt. Katahdin in Maine and Mrs. Slosson has also noticed the same occurrence on Mt. Washington.

Mr. Leng exhibited a part of the beetles taken, among which a number of northern species were noticeable. The Carabidae were strongly represented and the Coccinellidae were particularly numerous.

Mr. Davis read a paper entitled "Mantispa at Lakehurst, New Jersey." He stated that both *Mantispa brunnea* Say and *Mantispa interrupta* Say have been reported from New Jersey, but the former species has been considered quite rare. Recently a number of *M. brunnea* have been taken from the small oaks at Lakehurst, N. J., during July and August. A single male of this species was captured on May

30, 1905, and other specimens have been taken as late as September. But one specimen of *M. interrupta* has been found at Lakehurst which was captured July 30, 1905.

Both of these species of *Mantispa* seem to be widely distributed in the United States, particularly *M. brunnea*, which, according to Hagen, occurs from the Atlantic to the Pacific Ocean.

Mr. Barber made some remarks concerning *Pentatoma ligata* and exhibited specimens of this species as well as *P. juniperina* with which it has often been confused. Among other things he said that this insect had lately come into prominence as an enemy of the cotton plant in various parts of Northern Mexico as shown in a recent article in a Bulletin of the Division of Entomology of Washington, where a full account of its habits, life-history and distribution were given. Mr. Barber also spoke of the distribution of *P. ligata* and stated that he has found this species very abundant in the Huachuca Mountains, Arizona, where in the gardens it was partial to Asparagus.

MEETING OF DECEMBER 5, 1905.

Held at American Museum of Natural History. President C. H. Roberts in the chair with nine members and one visitor present.

Mr. Dickerson exhibited specimens of *Tomicus calographus* Lec. with eggs, larvæ and several interesting specimens of their borings beneath the bark of pine which he had found at Jamesburg, N. J. The specimens of bark borings showed all of the stages of their work from the formation of the nuptial chamber just after the entrance of the beetles, the primary and secondary galleries of the adults with their egg cavities from which the hatched larvæ worked out at right angles and at the end of these larval galleries were seen the pupal chambers. Several coleopterous enemies of this species were also exhibited.

Mr. Leng exhibited his collection of *Notiophilus* which genus he stated was in a very unsettled state and needed revision, a task which was being undertaken by Mr. Fall. He noted the well defined characters of certain species and remarked that he possessed several specimens which did not seem to fit the description of the known species and were therefore probably new. He remarked upon their habits and spoke of the difficulties in capturing these insects.

MEETING OF DECEMBER 19, 1905.

Held at the American Museum of Natural History. President C. H. Roberts in the chair with eleven members and one visitor in attendance.

On motion of Mr. Leng the secretary cast one ballot in favor of the election of Mr. Alfred C. Burrill as an active member of the society.

In pursuance of the custom at the last meeting in December the president appointed as a committee to nominate officers for the coming year the following: Messrs. Joutel, Watson and Zabriskie.

Mr. Bueno exhibited a collection of aquatic Hemiptera obtained from Costa Rica and made some remarks on the species contained in the collection.

Mr. Joutel gave an interesting account of some of the results and observations obtained by him in the investigation of the white ants and spoke of the Protozoan parasites which infest the intestine.

Mr. Barber exhibited all of the members of the genus *Dendrocoris* of the family Pentatomidæ among which was the new species (*D. schaefferi*) described by him from Brownsville, Texas. He spoke of the distinctive characters of each of the species, recording their distribution and habits so far as known.

ANNUAL MEETING, JANUARY 2, 1906.

Held at the American Museum of Natural History. President C. H. Roberts in the chair with ten members and one visitor present.

Mr. Joutel, of the nominating committee, announced that the committee had decided to make no change in the present officers for the ensuing year. On motion of Mr. Joutel the secretary cast one ballot in favor of the reelection of the present officers.

The president appointed the following committees:

Auditing committee, Messrs. Harris, Southwick and Bueno.

Field committee, Messrs. Davis and Engelhardt.

Delegates to Scientific Alliance, Messrs. Roberts, Groth and Wheeler.

Mr. Davis proposed Mr. Ignaz Matausch, 609 Columbus Avenue, City, as an active member.

Mr. Harris exhibited a box of exotic cicindelas.

MEETING OF JANUARY 19, 1906.

Held at the American Museum of Natural History. President C. H. Roberts in the chair with thirteen members in attendance.

On motion of Mr. Groth the Secretary cast one ballot for the election of Mr. Matausch as an active member of the Society.

Mr. Leng exhibited his collection of *Nomaretus* and made a few remarks concerning some of the species.

Mr. Schaeffer exhibited a number of interesting beetles, among them *Ludius peninsularis* Champ. from Arizona which he said was overlooked by Dr. Horn in his paper on the species of this genus. It resembles *L. texanus* very much but is distinguished principally by the prosternal process being abruptly declivous behind the coxæ. Also was shown a large black species which by the form of the metasternum is in some way intermediate between the genera *Ludius* and *Orthostethus*. Also a specimen of *Cotalpa subscibrata* Wickham, lately described, which he had received a few days ago from Mr. Knaus. Mr. Schaeffer remarked that this species will not hold good and in his opinion is a coarsely punctate form of *Cotalpa lanigera*.

MEETING OF FEBRUARY 20, 1906.

Held at the American Museum of Natural History, Vice-President C. W. Leng in the chair with eleven members and one visitor in attendance.

The librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

Canadian Entomologist, XXXVII, No. 12; XXXVIII, No. 1.

Bulletino della Soc. Ent. Italiana, XXXVI, No. 4.

Proc. U. S. Nat'l Mus., Vol. XXIX, No. 1432, pp. 501-515.

Proc. Amer. Acad. Arts and Sciences, Vol. XLI, Nos. 14-19 (1906).

Berliner Entom. Zeitschrift, XLIX, Nos. 3 and 4; L, Nos. 1 and 2.

Mus. Brooklyn Institute, Science Bulletin, Vol. I, No. 7.

35th Ann. Rept. Ent. Soc. Ontario, 1904.

Revista Mus. Paulista, Vol. VI (1904).

Insect World, Vol. IX, No. 12; Vol. X, No. 1.

Zeitschrift f. Wissenschaftliche Insekten biologie, Vol. I, No. 12; Vol. II, No. 1.

Mittheilungen d. Schweiz. Ent. Gesellschaft, Vol. XI, No. 3.

Anales del Museo Nacional de Buenos Ayres, Ser. III. Tome V.

Entom. Tidskrift, 1905, Nos. 1-4.

Wiener Entom. Zeitung, Vol. XXV, No. 1.

Mr. Davis proposed as an active member of the Society Miss Francis J. Thompson, 46 Stuyvesant Pl., New Brighton, Staten Is.

Mr. Watson proposed Mr. Harvey Mitchell, Westwood, N. J., and Mr. Gayland C. Hall, 409 W. 145th St., as active members.

The resignation of Professor W. G. Johnson as an active member was accepted.

Mr. Engelhardt entertained the Society with an interesting account of his collecting trip to southwestern Utah during the summer of 1905 and exhibited a box of the rarer insects taken by him on the trip.

Mr. Dickerson read a paper on *Hyperaspis signata* and exhibited a collection of a long series of this species, showing a number of interesting varieties. He spoke of the synonymy, and of the structural and color characteristics, habits of the larvæ and adult. He also exhibited specimens of the cottony maple scale upon which the larvæ feed.

Mr. Davis exhibited a *Papilio* and a small crab spider, the former having fallen a victim to the poisonous bite of the spider.

Mr. Matusch exhibited a case containing many interesting exotic moths.

Mr. Leng exhibited a box containing a map of the United States upon which specimens of *Cicindela repanda* were pinned according to their known geographical range.

MEETING OF MARCH 20, 1906.

Held at the American Museum of Natural History.

President C. H. Roberts in the chair with eleven members present.

On motion of Mr. Southwick, Miss Frances Thompson, Mr. Gayland C. Hall and Mr. Harvey Mitchell were elected active members of the Society.

Mr. Joutel proposed the name of Mr. E. A. Schwarz as an honorary member of the Society and upon motion was unanimously elected.

Dr. Zabriskie delivered a talk on the microscopical examination of the external structure of hemipterous insects of the genera *Anasa*, *Lygaeus* and *Alydus*. The address related chiefly to curious structures which are seen after suitable bleaching and microscopical mounting of dissections of these insects and which are found in the antennæ, mouth parts, legs, pronotum, coxæ and wings. Especially noticeable in the antennæ is a small cup-like, supplementary joint, between the third and fourth joints, thus far found only in both sexes of *Anasa tristis*. In the mouth parts attention was directed to the slender, ornamented labrum; the form and arrangement of the barbs on the delicate pair of lancets; the varying form of the tips of the pair of stout lancets and

he two unique, stout, short, conical spines always found in the same relative position near to and on opposite sides of the cleft and close to the base of the second joint of the beak, in both sexes of each species under examination. The anterior legs present a very interesting comb of about thirty spines, of nearly equal length and diameter, lying in a straight row across the inner side of the apex of the tibiae, apparently useful for toilet purposes. The pronotum and the regions of the coxae were mentioned as showing an extraordinarily large size of pore-canals, passing through the thick chitin, and probably affording means of exudation of secretions. In the description of the wings the most striking feature was the curious interlocking apparatus. The fore wing, or hemelytron, has on the under surface at the posterior edge, in the acute angle of the anal cell or clavus, a prominence and this prominence has a deep pit. The anterior edge of the pit has a single or multiple comb of depending spines, and the posterior edge has a projection furnished with apparently fish-scale-like spines, all provisionally named the "wing lock." The hind wing has the costal or anterior edge upturned for a short distance, directly opposed to the "wing lock," which upturned edge is also furnished with fish-scale-like spines, this upturned edge being provisionally named the "wing hasp." When the wings are expanded the hasp slides in the lock and is securely held. When the wings return to a position of rest the hasp easily slides out of the lock.

The address was illustrated by fifty-six lantern slides, of the speaker's own preparation, consisting of etchings on sheet gelatine, mounted between two cover glasses of regulation sized lantern slides, the etchings being tracings of pen sketches through the camera lucida from microscopical mounts of his own dissections.

Mr. William T. Davis presented some remarks on "Some Interesting Insects from New Jersey."

Ptynx appendiculatus Fab., an ant-lion, is mentioned from Brazil by Hagen. Mrs. Slosson captured it in Florida. According to Mr. Nathan Banks it has been found in North Carolina, and lately in New Jersey. The specimens exhibited both came from New Jersey. One was captured by Mr. Frank E. Watson at South Lakewood on July 11, 1902, and the other was collected on July 30, 1905, at Lakehurst.

Panchlora viridis Burm. is a delicately colored West Indian cockroach collected by Mr. James Chapin in a house on Staten Island about the first of March. This species has previously been reported from the vicinity of New York.

Ecanthus pini Beut. The pine tree cricket was originally described from Windham County, Conn., by Mr. Beutenmüller. The specimens exhibited came from Lakehurst, N. J., collected in July and September.

The moth *Pygarcia abdominalis* Grote is recorded from Florida, but the specimen shown was beaten from a cedar tree at Lakehurst, N. J., on the twenty-ninth of May, 1905. The specimen was shown to Professor J. B. Smith and he wrote as follows: "This is an altogether new locality and a great extension of the range of this insect. Its capture and the circumstances under which it was taken are well worth recording."

A specimen of *Necrophorus pustulatus* Hirsch was exhibited which was captured on Staten Island beneath an electric light on July 19, 1905. The species is not mentioned in the New Jersey, Washington, or Cincinnati lists of Coleoptera. It is, however, recorded from the vicinity of Buffalo and Dr. Horn records its distribution from the New England States to Texas.

Cuterebra buccata Fab. This fly has been reported from New Jersey but Mr. Davis called attention to the beautiful and conspicuous colors of the eyes of a specimen taken at Lakehurst, N. J.

Mr. Roberts after urging the importance of a careful study of the structure of Coleoptera as shown in the antennæ, legs and parts of the under surface of the body and referring to the splendid results obtained therefrom by Dr. Sharp, Mr. Fall and others, exhibited a few specimens of Dytiscidæ and called attention to some of their peculiarities of structure. A deep round depression or pit in the last abdominal segment of *Calambus farcitus* male, at once distinguishes it from other species. Another undescribed form, referred to as *tuberculiiventris* had depressions so placed as to leave a distinct broad, flattened, tubercle on each side of the same segment. With *Calambus dispar* Lec. (*H. dissimilis* of G. and H.) was mixed in most collections, a form undescribed but which was also readily separated by differences of the last segment. *C. dispar* has a narrow but distinct groove extending perpendicularly nearly its whole length while the species mixed with it and rather closely resembling it, has the same segment shallowly and horizontally depressed.

Mr. Roberts showed specimens of Fall's *Calambus pedalis* and *C. femoratus* and called attention to their peculiar leg structure. Finally reference was made to the antennal structure of *Hydroporus diversicornis*, *difformis*, *oblongus* and an undescribed species from the middle west with abnormal antennæ which at once separated them from each other and all other species of the genus.

The separating of two species of *Hydroporus* from Newfoundland almost identical in general form, punctuation, color, etc., by differences in the antennæ and front tarsi was especially interesting.

Specimens of all of the species referred to were shown, both male and female, but the characters spoken of were almost entirely those of the male.

MEETING OF APRIL 3, 1906.

Held at the American Museum of Natural History, Vice-President C. W. Leng presided with nine members present.

Mr. Davis exhibited two boxes of galls illustrating the work of gall insects on the following plants: rose, blackberry, raspberry and Potentilla.

Mr. Davis also exhibited a number of species of Cicadas, among which were *Tettigera hieroglyphica*, *Cicada tibicen*, *C. pruinosa* and *C. canicularis*. The three last-named having for some time been considered as one species but Mr. Davis and Mr. Joutel consider them three distinct species, basing their conclusions upon color, structural and vocal differences.

MEETING OF APRIL 17, 1906.

Held at the American Museum of Natural History. President C. H. Roberts in the chair with eleven members and one visitor present.

The librarian reported the receipt of the following exchanges:

Stettiner Entom. Zeitung, Vol. LXVI, Nos. 1 and 2.

Bulletino della Soc. Entom. Italiana, Vol. XXXVII, No. 1.

Insect World, Vol. X, No. 2.

Canad. Entom., Vol. XXXVIII, Nos. 3 and 4.

- Proc. Amer. Phil. Soc., Vol. XLIV, No. 181.
Proc. Amer. Acad. Arts and Sciences, Vol. XLI, Nos. 20-24.
U. S. Dep't. Agric. Division of Entom., Bull. No. 56.
Delaware Agr. Exp. Station Bull., No. 73.
Verhandl. d. k. k. Zool. Bot. Gesell. Wien., Vol. LV, Nos. 9 and 10.
Zeitschrift f. Wissenschaftlich Insectenbiologie, Vol. II, No. 2.
Journ. Cinn. Soc. Nat. Hist, Vol. XX, Nos. 5, 6 and 7.
North Carolina Dept. of Agric., Entom. Circular, No. 17.
Proc. U. S. Nat'l Mus. Washington, Vol. XXIX, Nos. 1434, 1438, 1444.
Wiener Entom. Zeitung., XXV, Nos. 2, 3 and 4.
Annales de la Soc. Entomologique de Belgique, Vol. XLIX.
Tijdschrift voor Entomologie, 1906, No. 1.
Deutsche Entom. Zeitschrift, 1906, No. 1.

Mr. Schaeffer made some remarks on *Bradycinetus* and *Bolboceras*. In the Genera Insectorum, Boucamont places *Bradycinetus* as a subgenus of *Athyreus*, which according to his own definition will not hold good. The principal characters separating the genera in this group are taken from the comparative width of the process separating the middle coxæ. In *Athyreus* the middle coxæ are separated by a process which is very wide and as long as broad, which is not the case in the species of *Bradycinetus* in which the process is always longer than broad and narrower between than behind the coxæ. *Bradycinetus* is more closely allied to *Bolboceras* than to *Athyreus* and may even prove not to be distinct from the former genus when the 129 species of *Bolboceras* are carefully examined. A new species from Arizona is in this respect intermediate, having the process narrower than our other species. Our common *Bolboceras farctus* has the process with a tooth-like elevation and has also the eyes completely divided (to which Linell has called attention) which makes the erection of a new genus necessary. *Bradycinetus hornii* and *B. minor* have the intermediate coxæ nearly contiguous, the process separating them is very narrow which places them in the genus *Bolboceras*. The different forms of the intermediate intercoxal process in the genera *Athyreus*, *Bradycinetus* and *Bolboceras* were illustrated on the blackboard and the North American species of the last two genera and also the North American species of *Copris* were exhibited. Mr. Barber exhibited a few Hemiptera-heteroptera from the Huachuca Mountains, Arizona and made some remarks concerning the distribution of some of the species. Among them were the following:

Chlorocoris hebetatus, *C. subrugosus*, *C. n. sp.*, *Hymenarcys crassa*, *Podisus lineolatus*, *P. marginiventris*, *Stachyocnemis apicalis*, *Narnia femorata*, *N. pallidicornis*, *Araphe carolina*, *A. cicindeloides* and *Stenomacra marginella*.

H. G. BARBER,
Secretary.

ERRATA ET ADDENDA.

- Page 175, line 37, for "*cruciaus*" read *crucians*.
 Page 176, line 7, for "rom," read from.
 Page 177, line 20, for "developement," read development.
 Page 178, line 3, from bottom, for "Roder" read Roeder.
 Page 181, line 25, insert (not Bellardi) after Blanchard.
 Page 182, line 26, for "Graham" read Grabham.
 Page 188, line 5, for "DEINOCERITIES," read DEINOCERITES.
 Page 189, line 36, for "20," read 21.
 Page 195, line 11, for "short" read long.
 Page 196, line 11, for "southermost," read southernmost.
 Page 196, line 13, for "*Gynometopa*," read *Gymnometopa*.
 Page 196, line 17, for "*fasiatus*" read *fasciatus* and insert (not deVillers).
 Page 198, after line 23, insert ? *Culex bracteatus* Coquillett, Proc. ent. soc. Wash. vii, 184, 1906.
 Page 198, line 20, for "Mexico" read Guatemala.
 Page 200, after line 5, insert *Culex varipalpus* Blaisdell, Ent. News, xvii, 107, 1906.
 Page 201, line 2, insert (not Walker) after Dyar.
 Page 201, after line 15, insert *Culex sylvicola* Grosbeck, Can. ent. xxxviii, 129, 1906.
 Page 202, after line 26, insert *Culex lativittatus* Coquillett, Ent. News, xvii, 109, 1906.
 Page 202, line 35, for "1905" read 1805.
 Page 202, line 36, for "1805" read 1905.
 Page 210, line 15, for "*Wyeomia*" read *Wyeomyia*.
 Page 211, line 13, for "*pipens*" read *pipiens*.
 Page 212, line 5, for "cocoa," read cacao.
 Page 213, line 7, 8, for Barbadoes, read Barbados.
 Page 220, last line, for "four" read fours.
 Page 222, line 2, for *Wyeomia*, read *Wyeomyia*.
 Page 222, line 27, for "*divisor*" read *divisor*.
 Page 225 and 226, for "*niveipes*" read *nivipes*.
 Page 225, line 13, insert "named" after have.
 Page 227, line 28, 29, dele "tube and plate with back basal ring" and for "*aporonoma*" read 10.
 Page 228, line 31, for "*Wyeomnia*" read *Wyeomyia*.

INDEX

TO THE GENERIC AND SPECIFIC NAMES OF ARTHROPODA IN VOLUME XIV.

Generic names begin with a capital, specific ones with a small initial.

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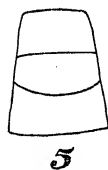
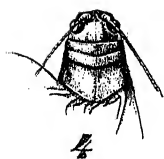
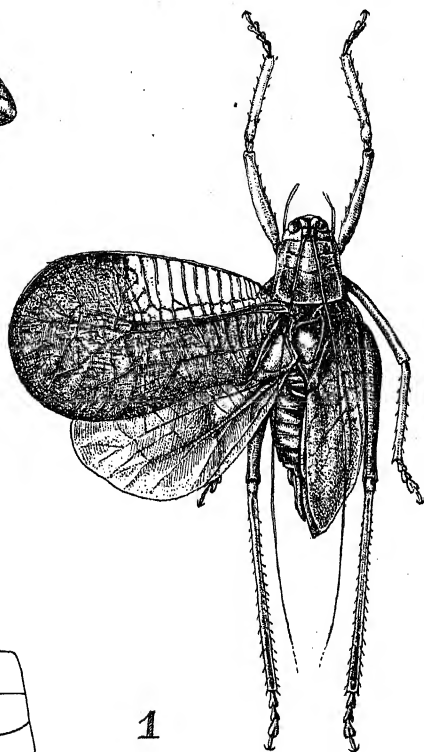
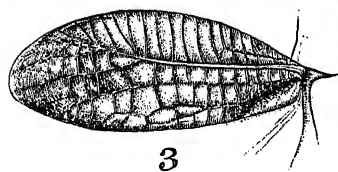
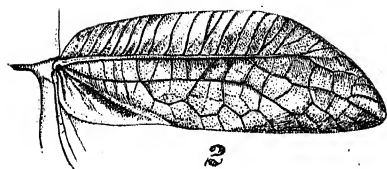
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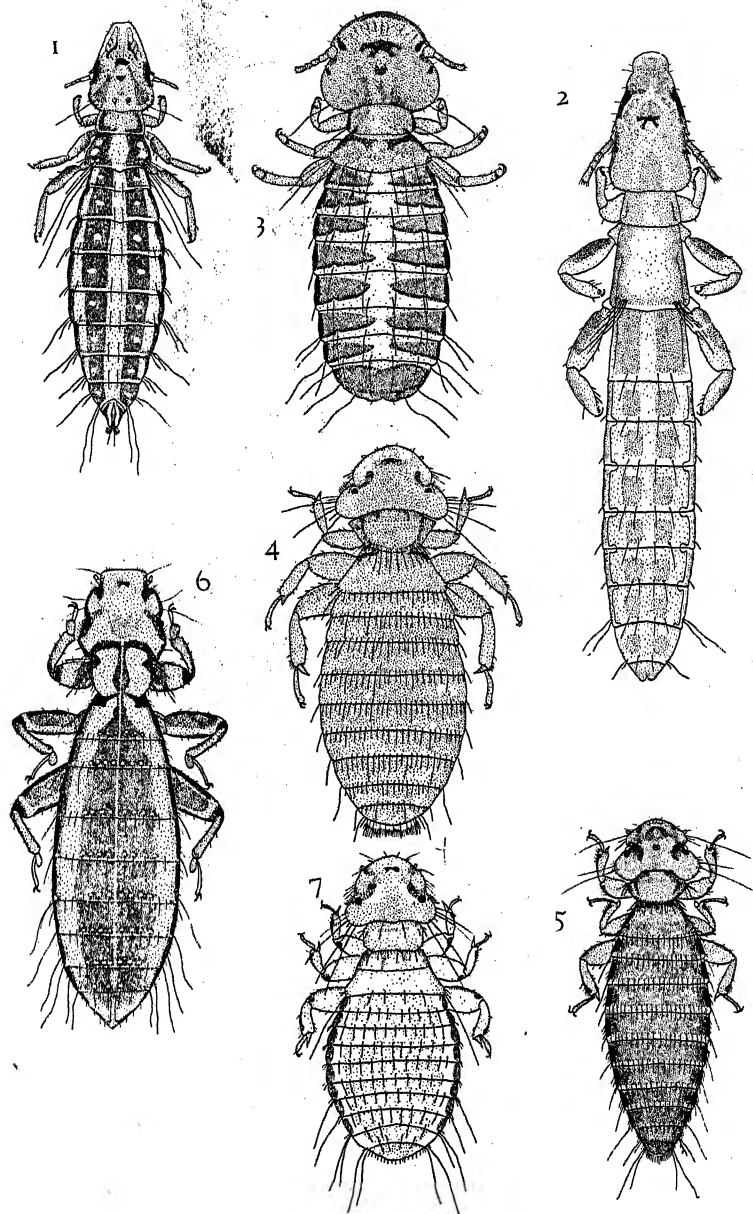
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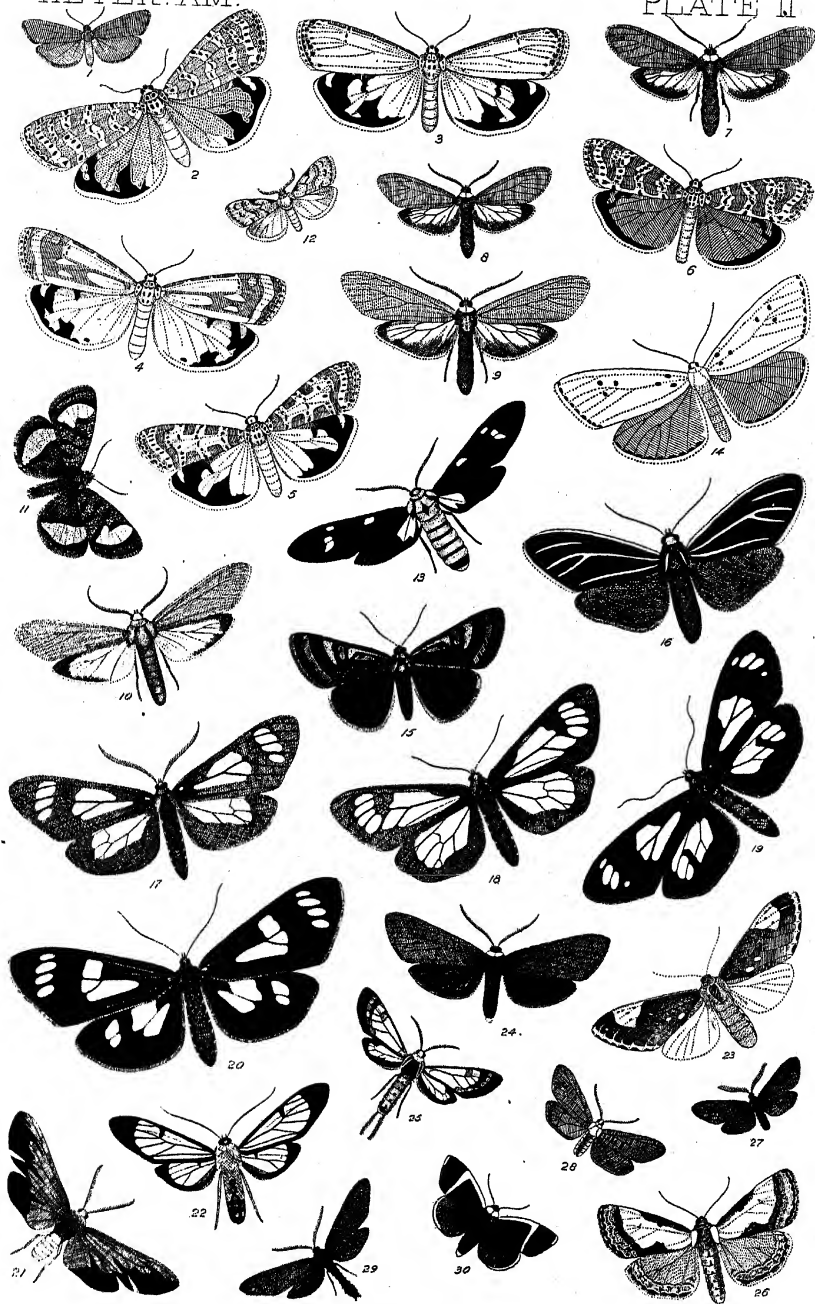
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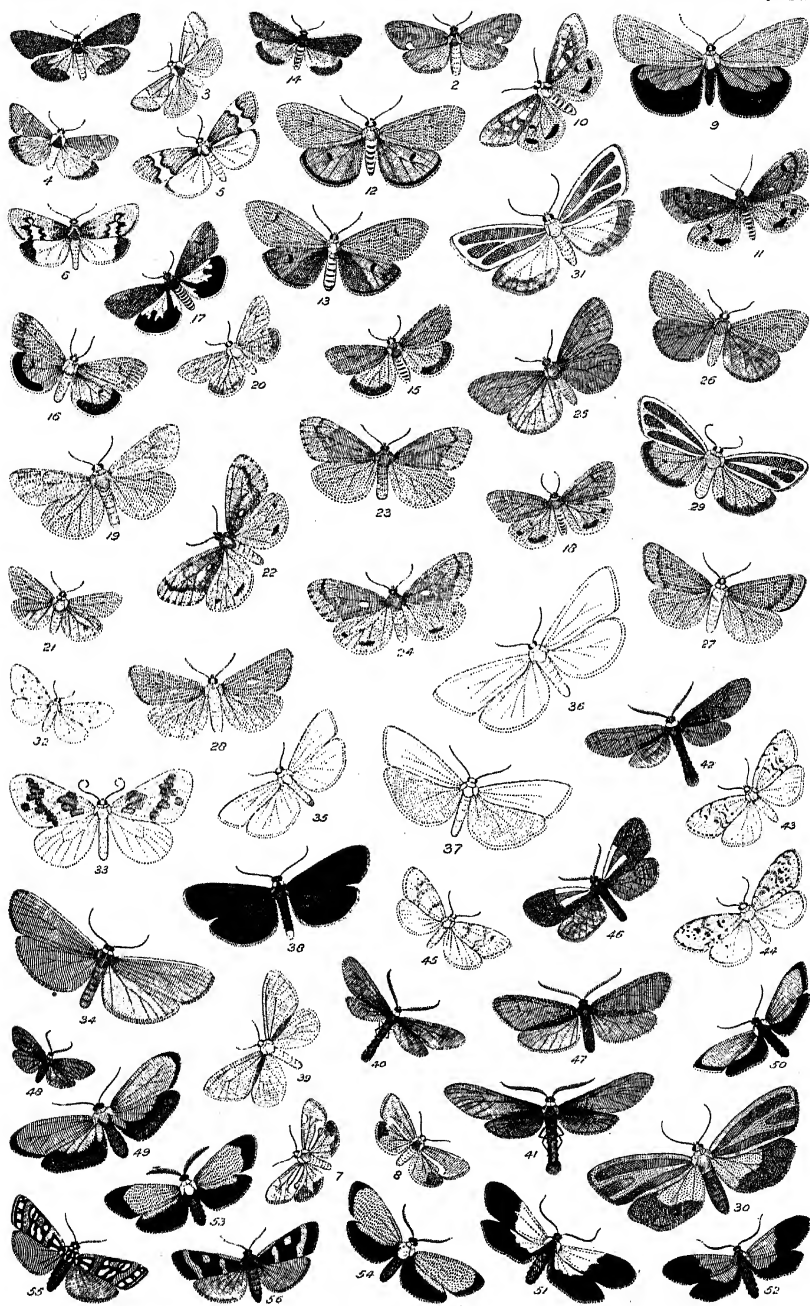


North American Orthoptera.

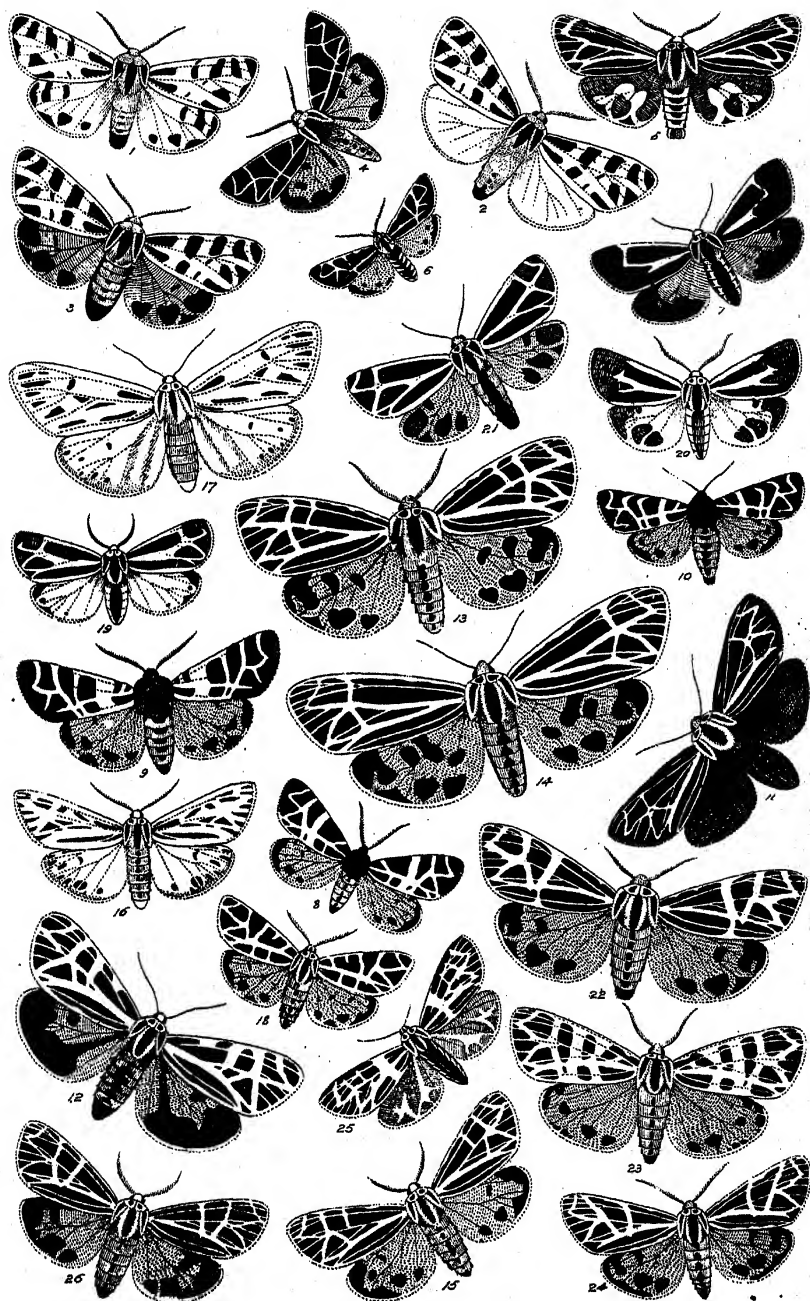


South American Mallophaga.

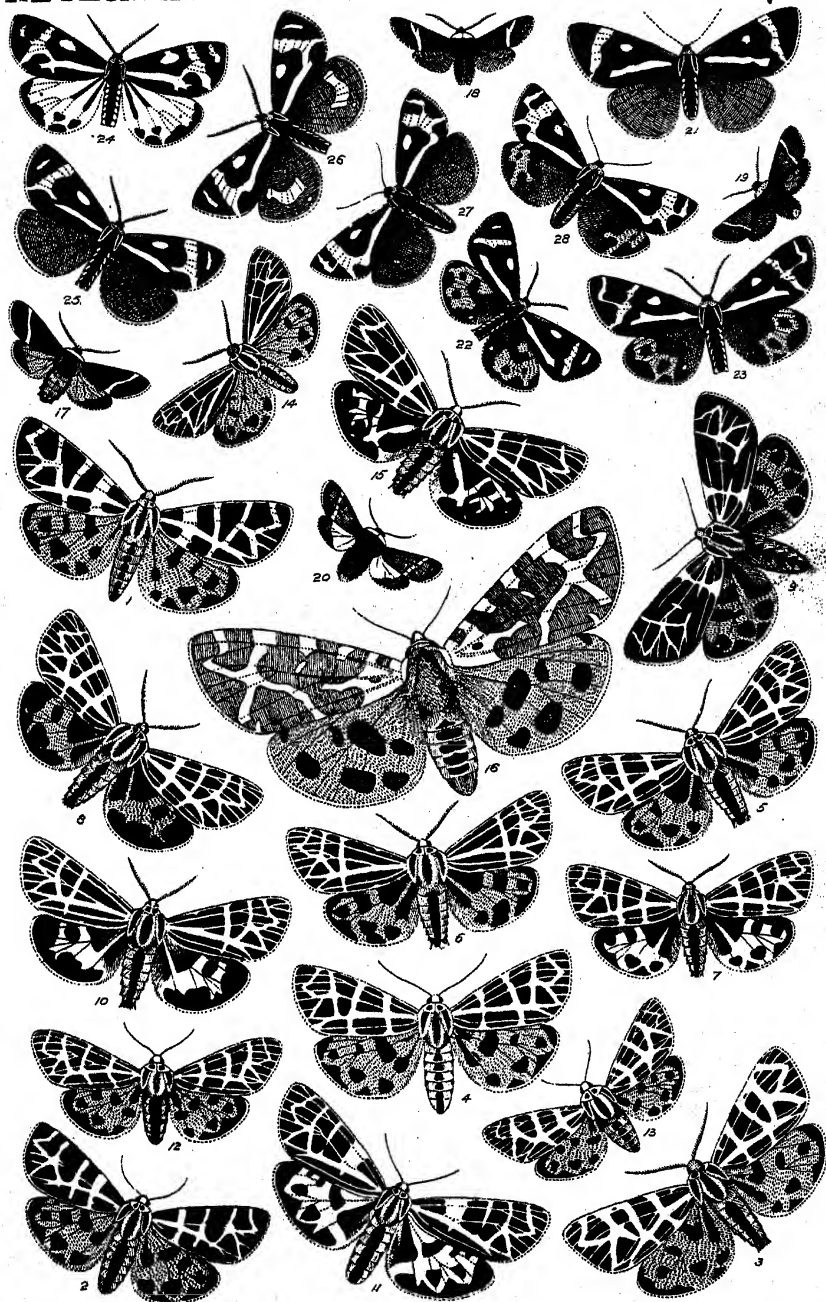


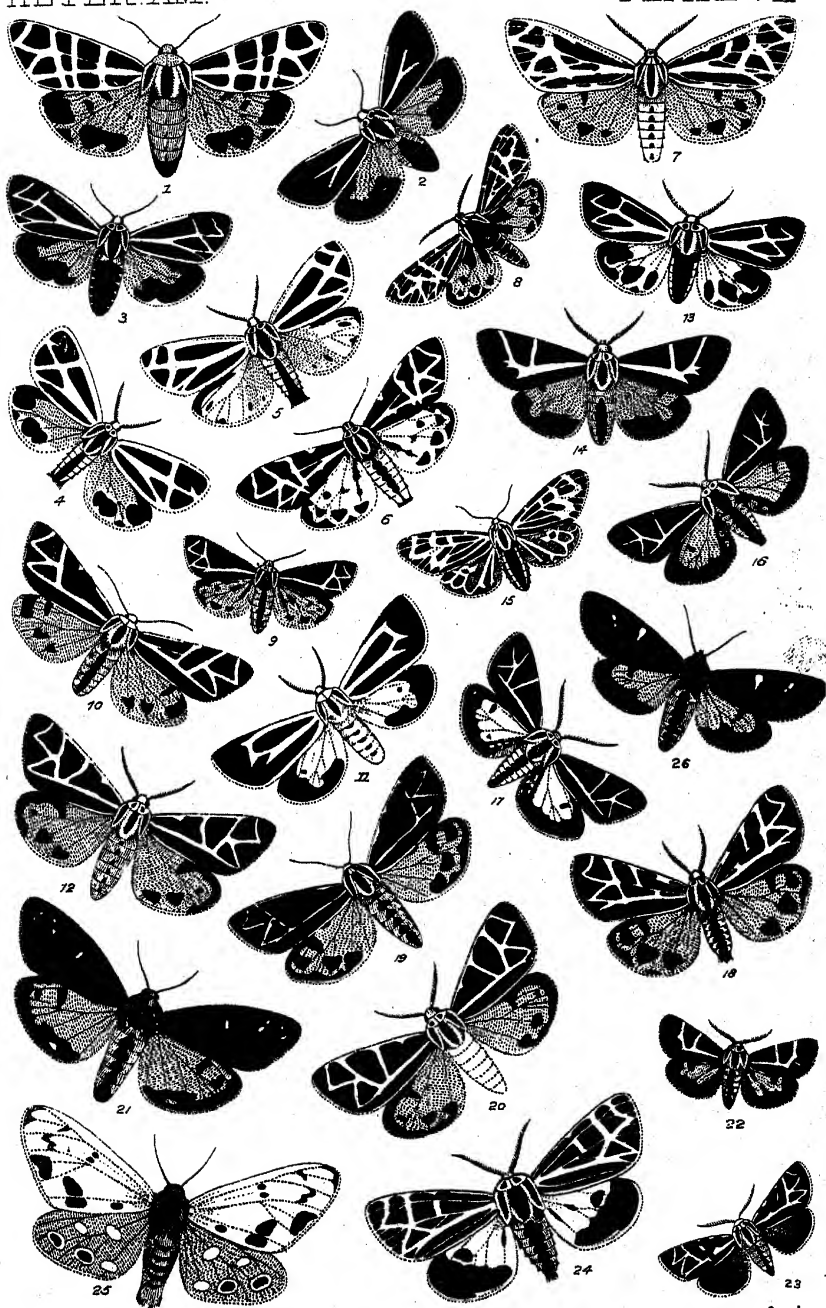


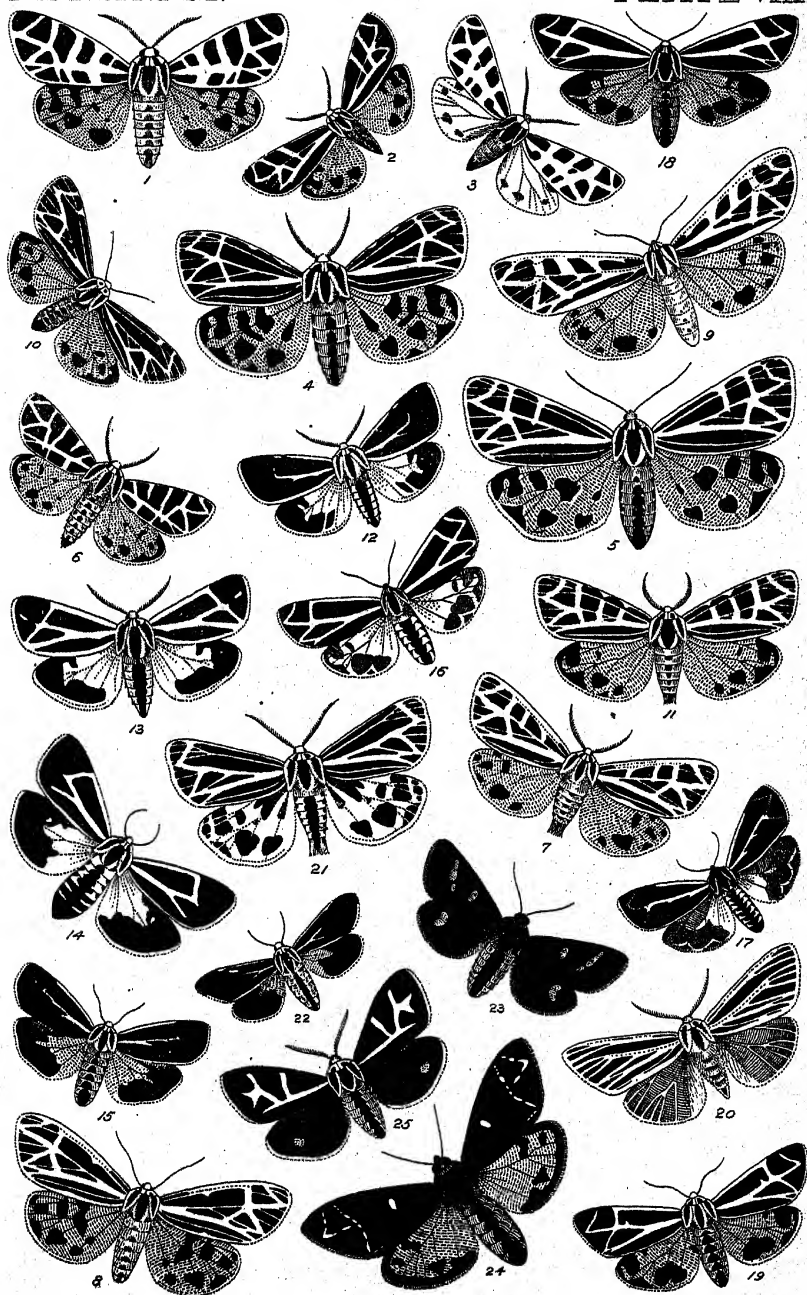


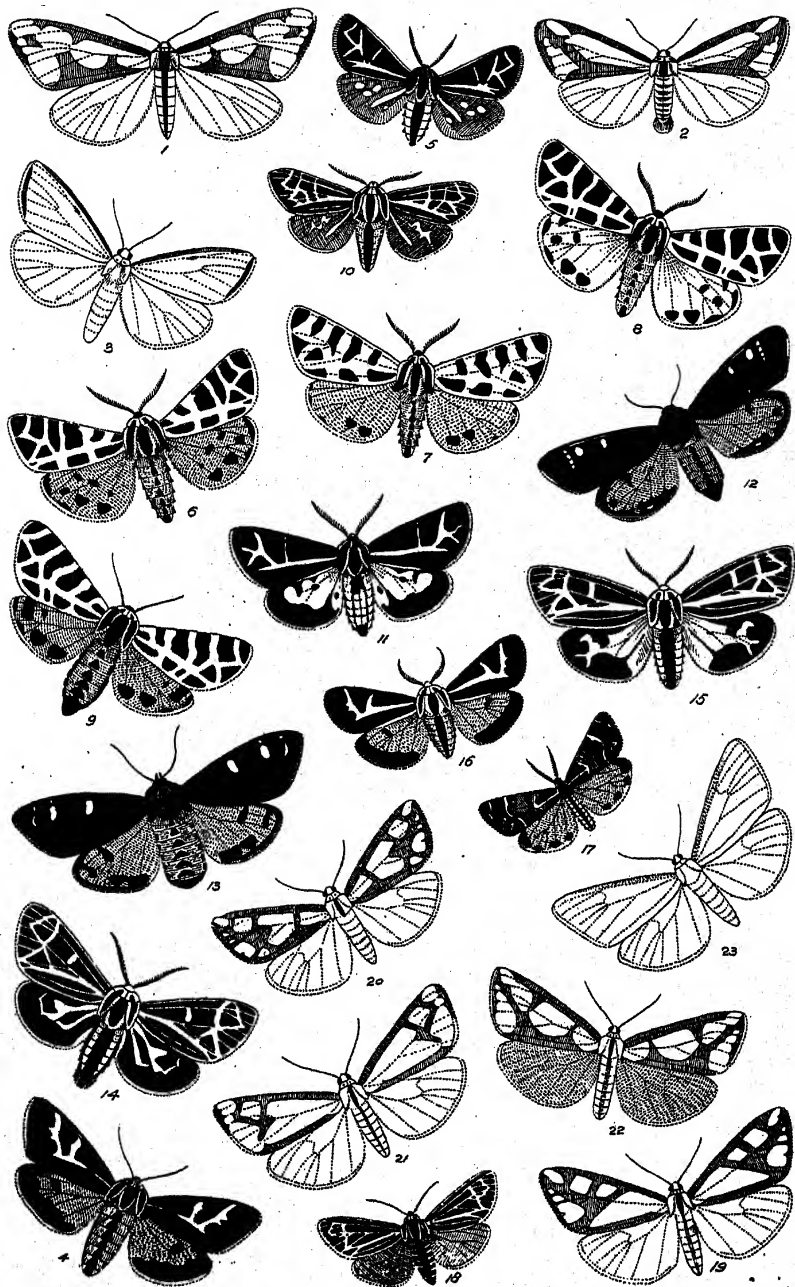


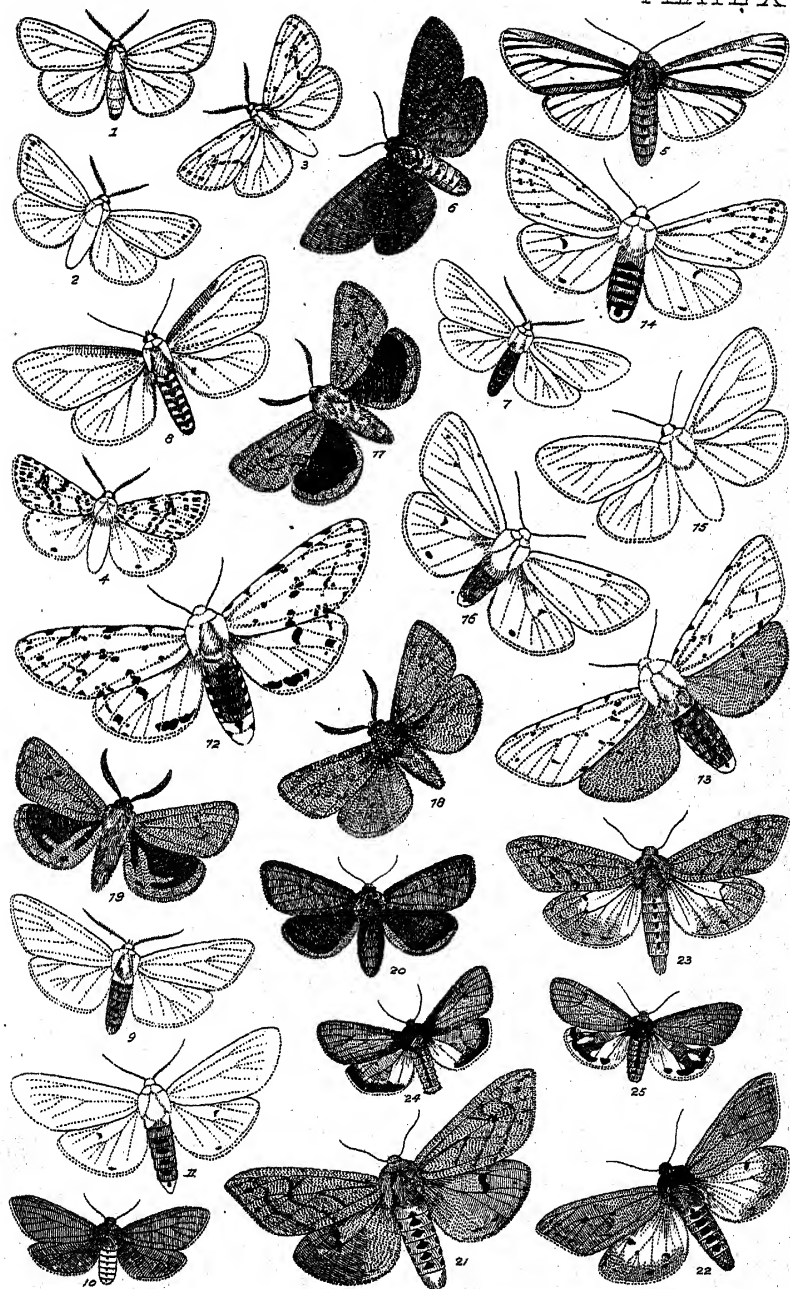
R. H. Stretch, del.

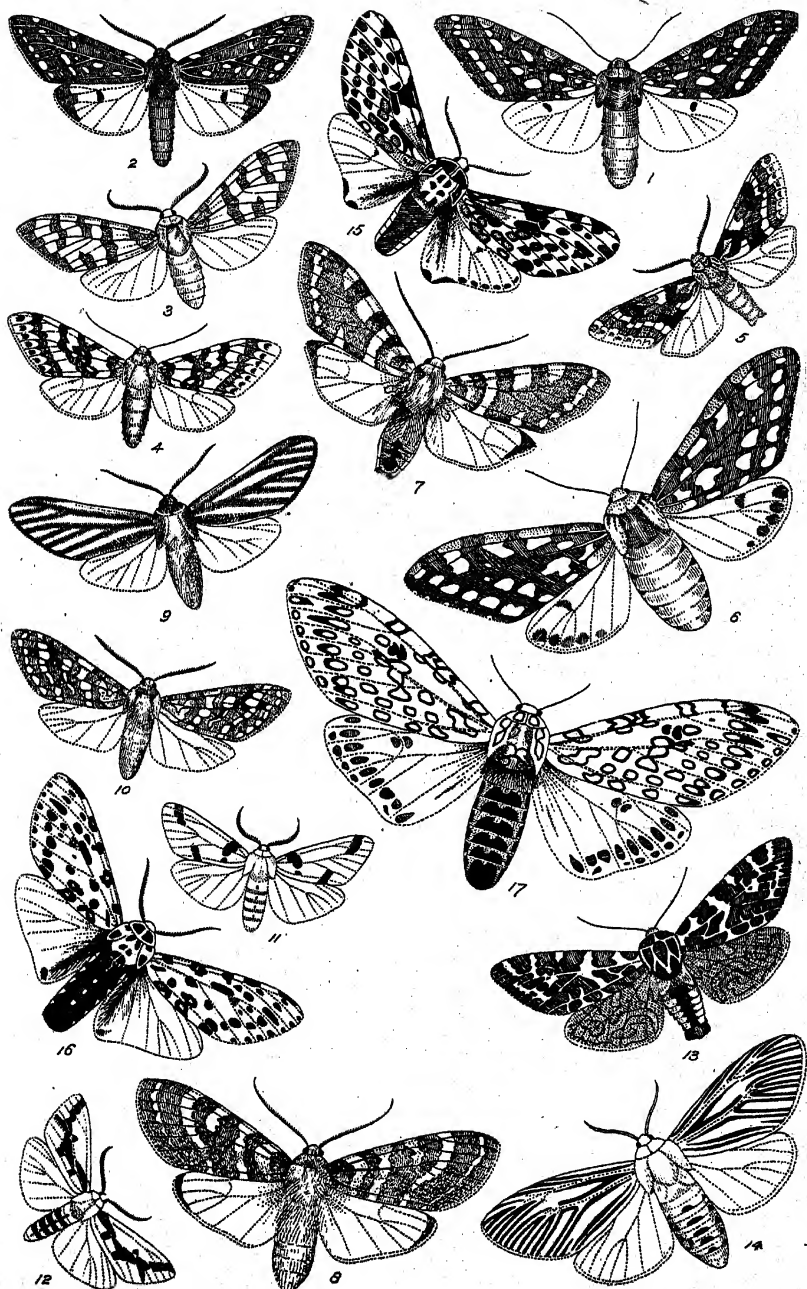


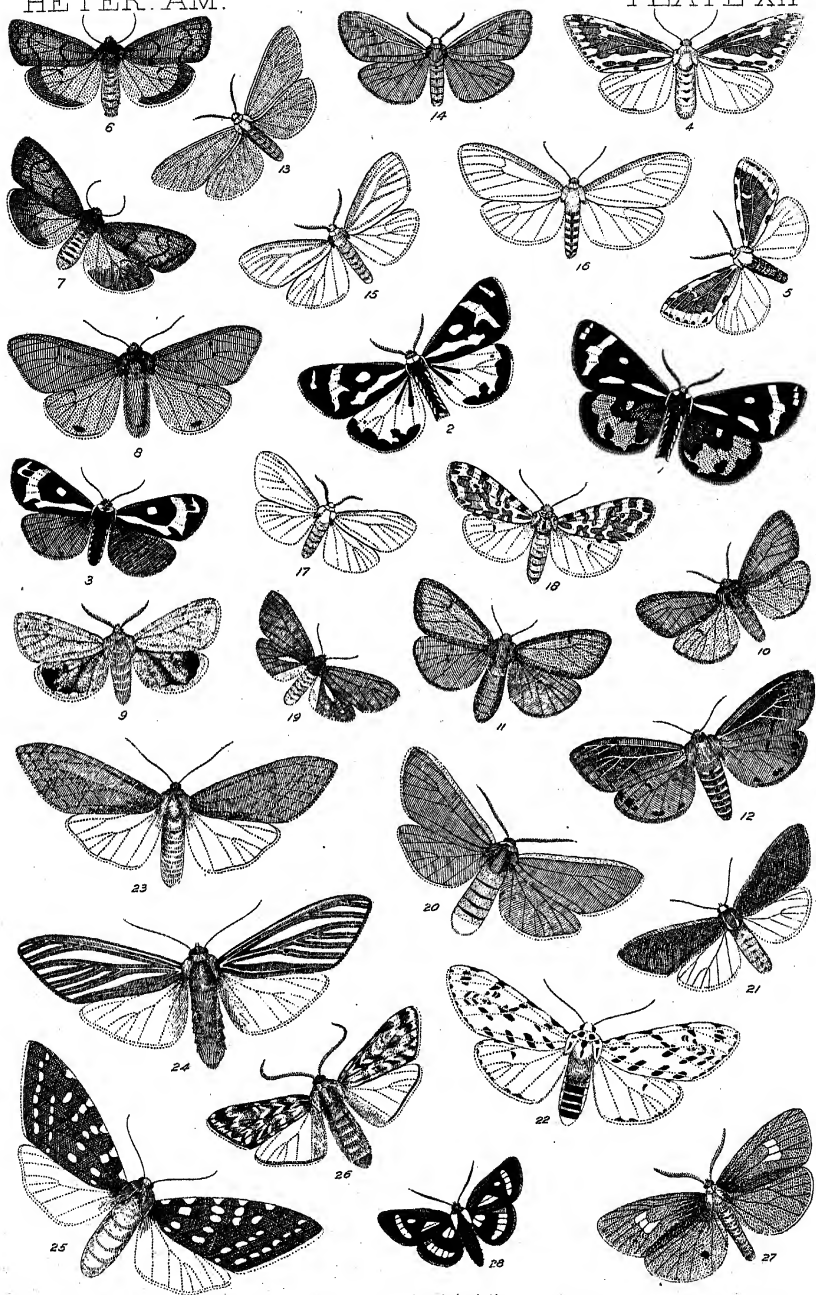


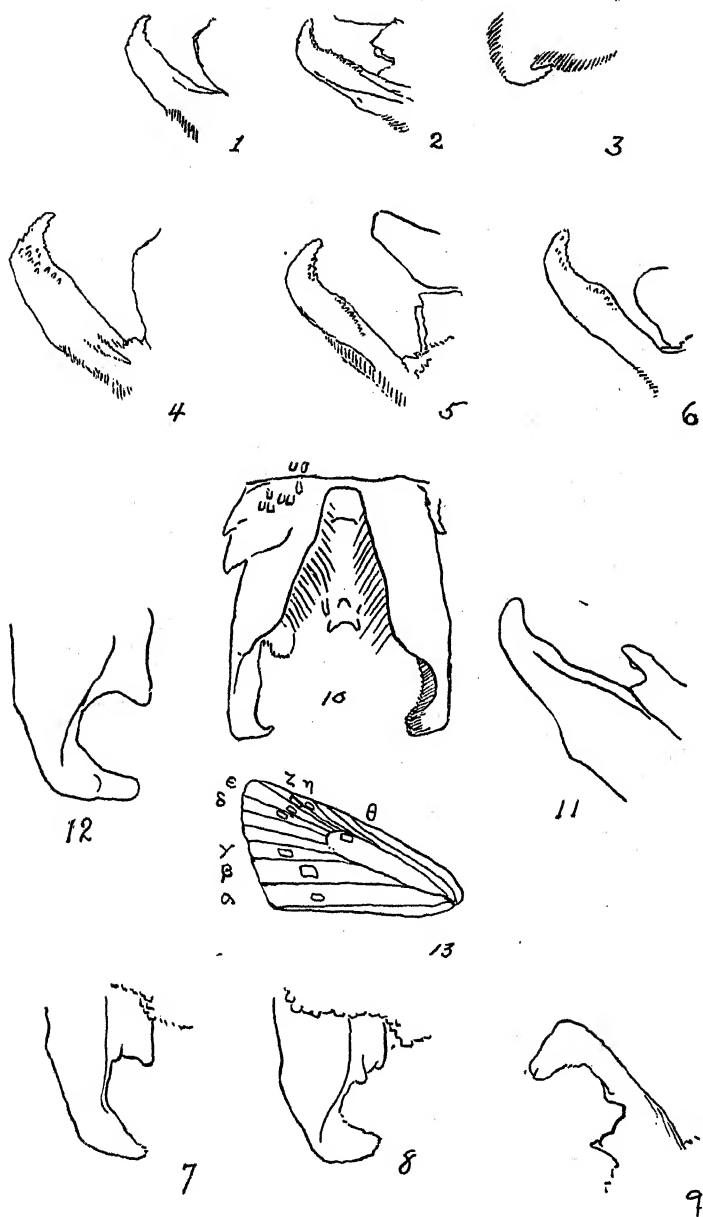




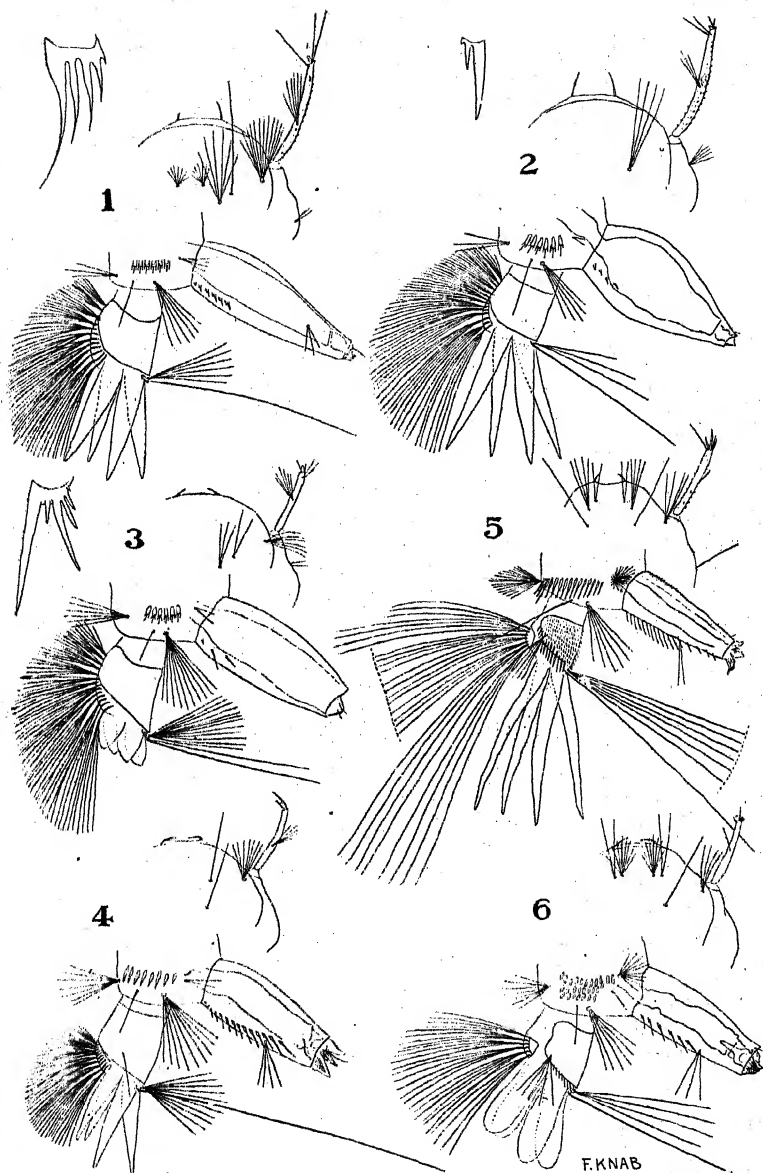






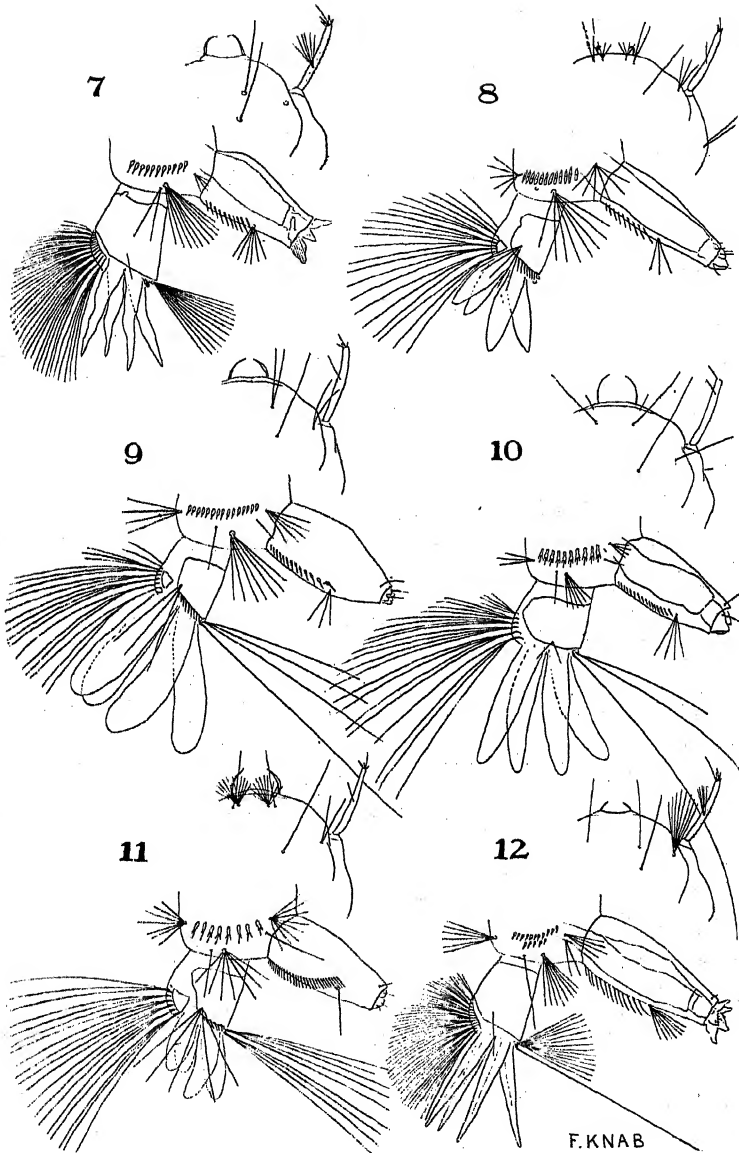


Genitalia of the genus *Thanaos*.



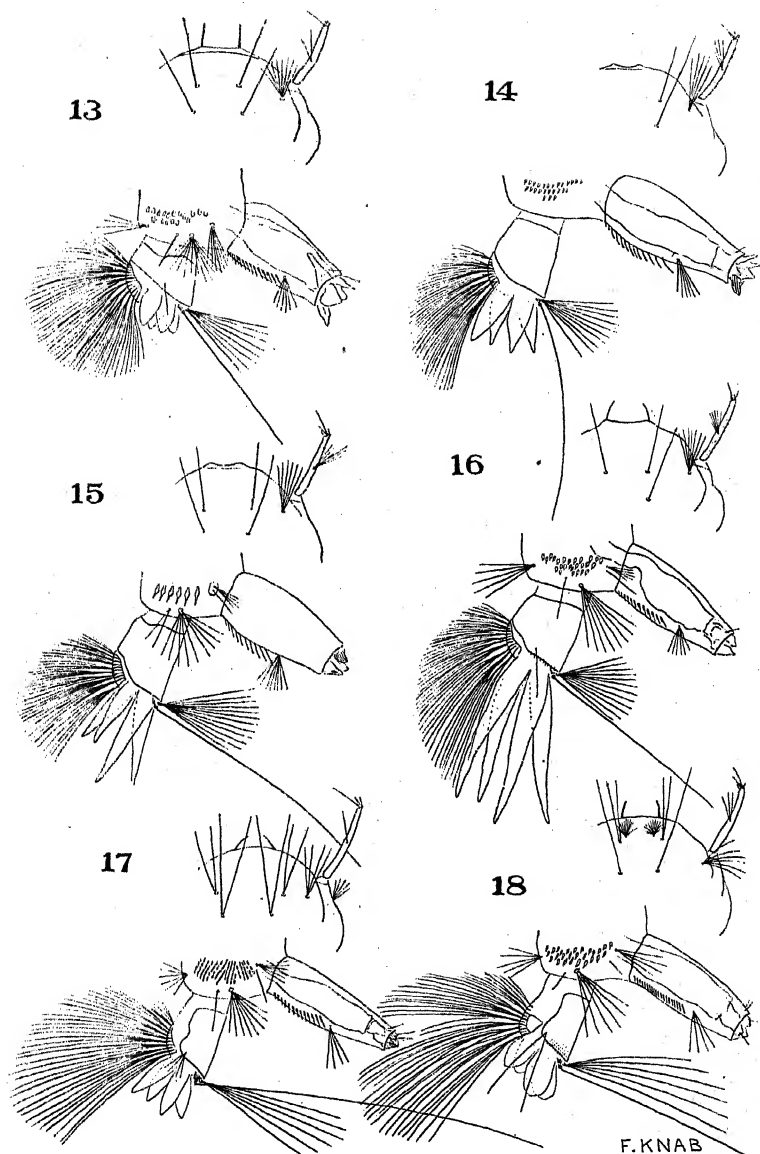
1. *Janthinosoma infinc* D. & K.
3. *J. pygmaea* Theo.
4. *Aedes tormentor* D. & K.

2. *J. scholasticus* Theo.
5. *A. walkeri* Theo.
6. *A. busckii* Coq.



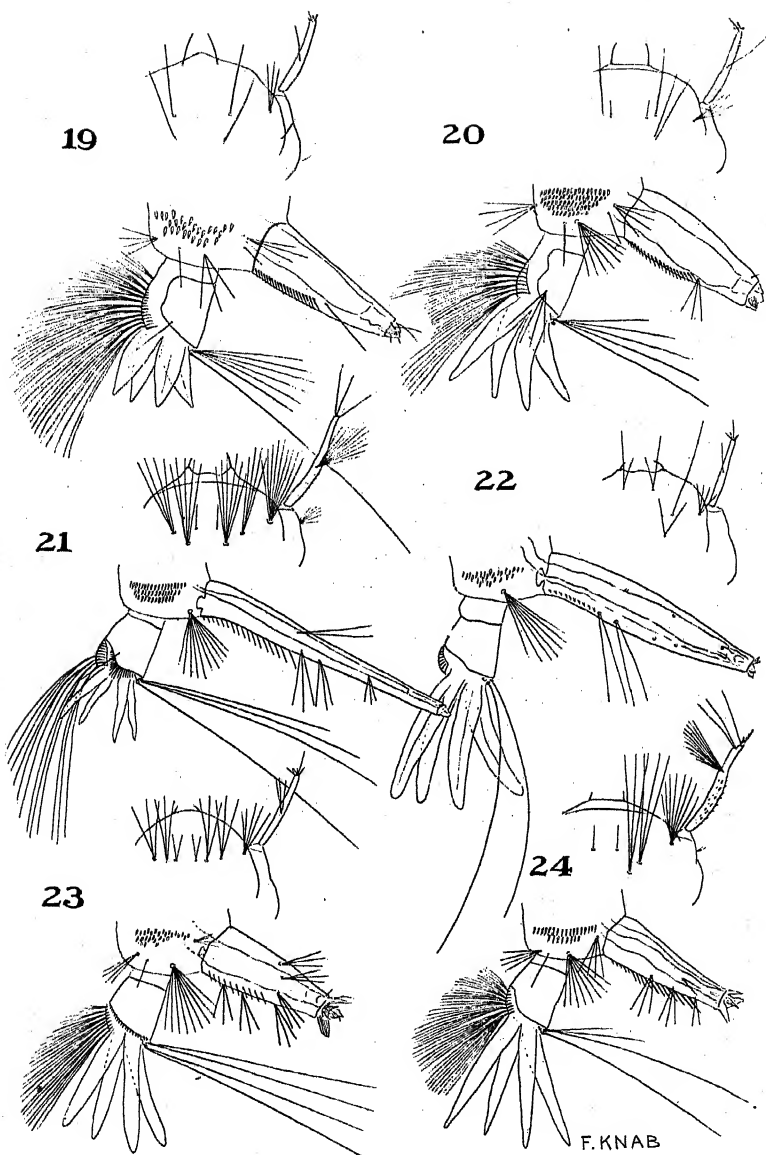
7. *Aedes meridionalis* D. & K.
 9. *A. albonotata* Coq.
 11. *A. mediocincta* Coq.

8. *A. philosophicus* D. & K.
 10. *A. calopus* Meig.
 12. *A. infirmatus* D. & K.



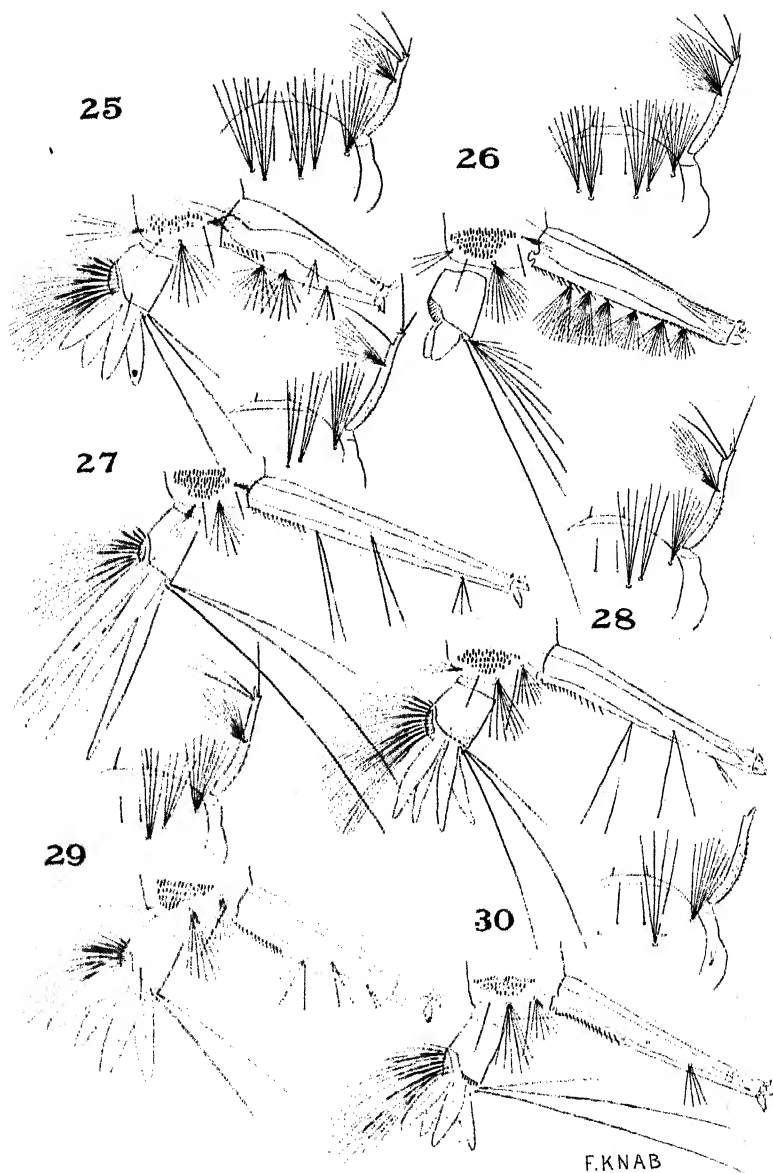
13. *Aedes damnosus* Say.
 15. *A. atlanticus* D. & K.
 17. *A. lateralis* Coq.

14. *A. habanicus* D. & K.
 16. *A. euplocamus* D. & K.
 18. *A. cyaneus* Fab.



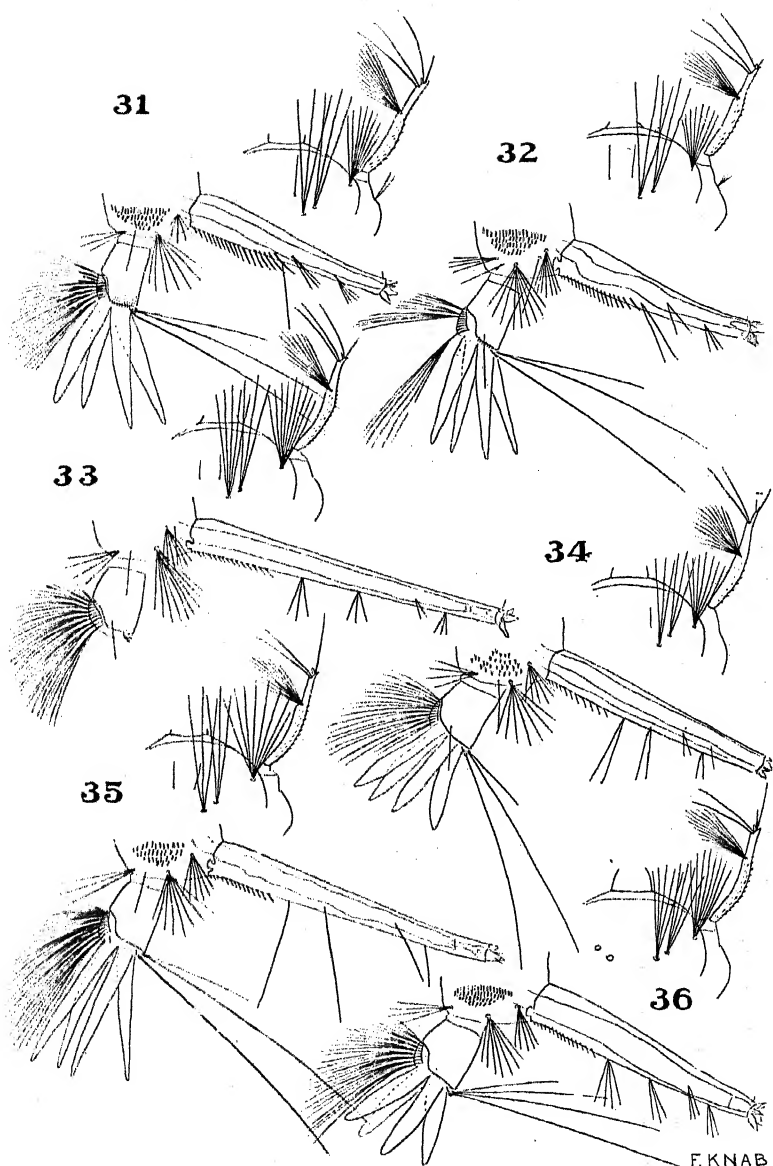
19. *Aedes knabi* Coq.
 21. *Culex bisulcatus* Coq.
 23. *C. lactator* D. & K.

20. *A. insolita* Coq.
 22. *C. pleuristriatus* Theo.
 24. *C. interrogator* D. & K.



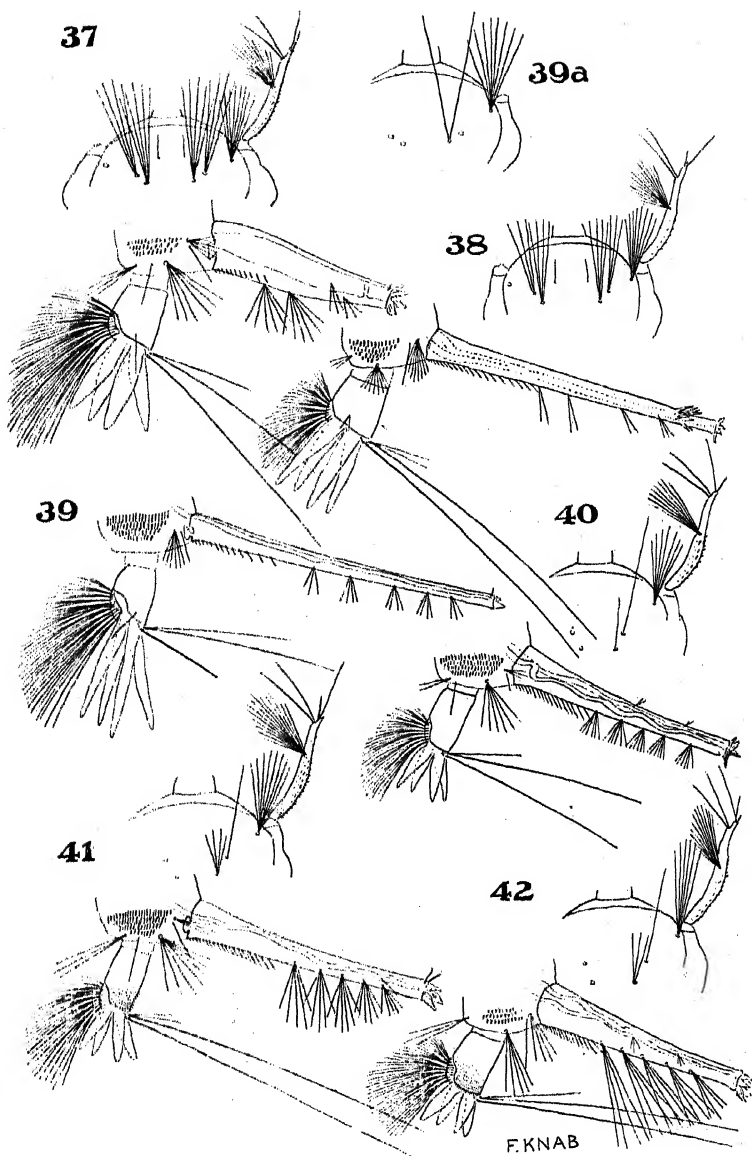
25. *Culex barbarus* D. & K.
 27. *C. mortificator* D. & K.
 29. *C. cyricator* D. & K.

26. *C. bahamensis* D. & K.
 28. *C. curmodyae* D. & K.
 30. *C. declarator* D. & K.



31. *Culex proclamator* D. & K.
 33. *C. habilitator* D. & K.
 35. *C. regulator* D. & K.

32. *C. inquisitor* D. & K.
 34. *C. factor* D. & K.
 36. *C. pipiens* Linn.



37. *Culex cubensis* Big.

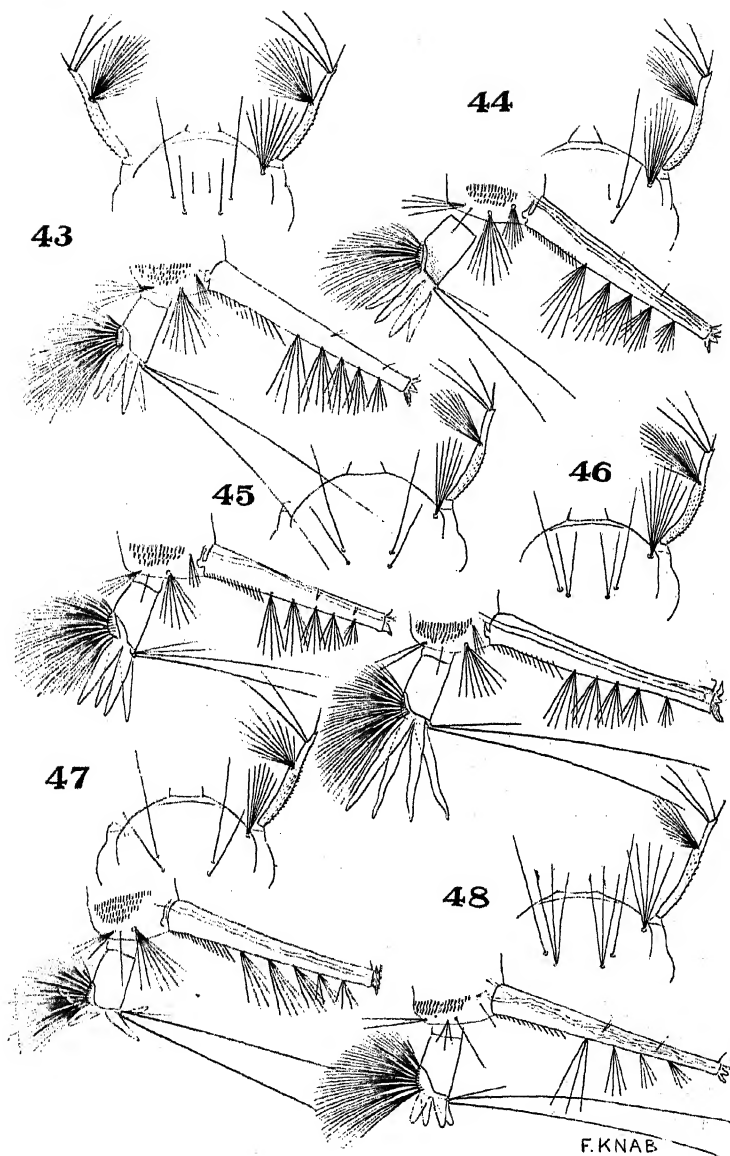
39. *C. derivator* D. & K.

41. *C. inhibitor* D. & K.

38. *C. coronator* D. & K.

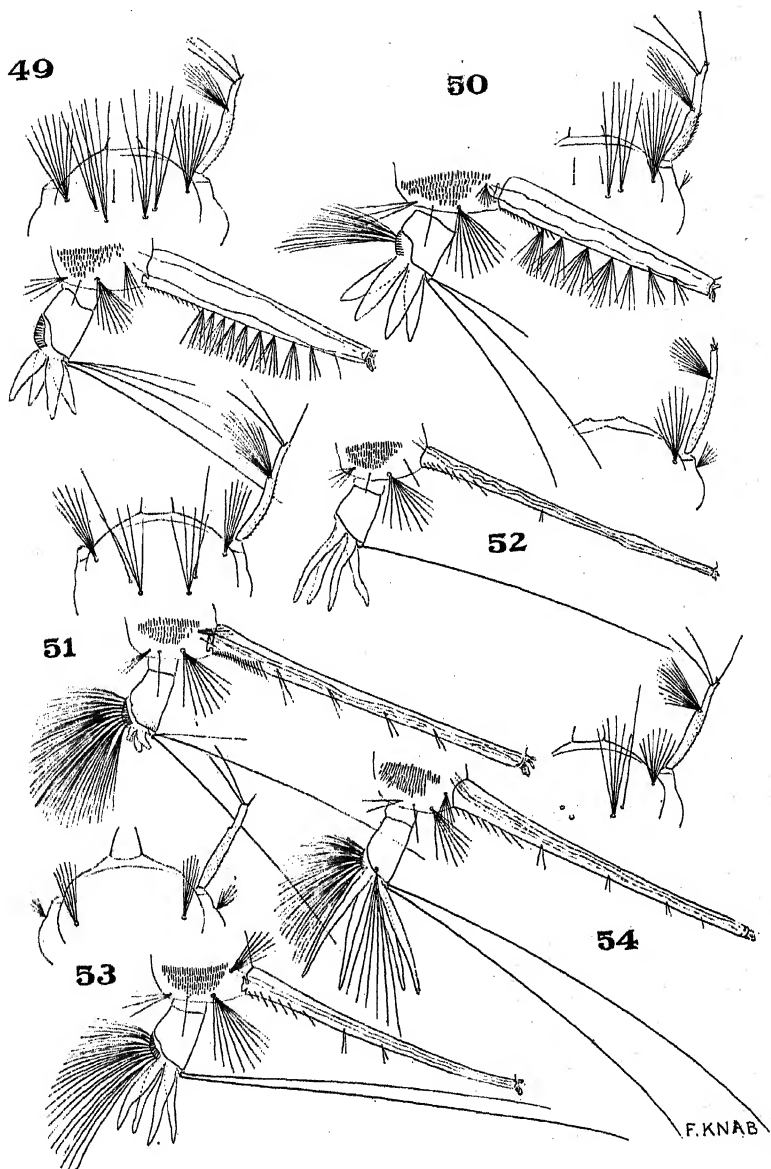
40. *C. investigator* D. & K.

42. *C. mutator* D. & K.



43. *Culex elevator* D. & K.
 45. *C. conspirator* D. & K.
 47. *C. gravilator* D. & K.

44. *C. educator* D. & K.
 46. *C. simulator* D. & K.
 48. *C. decorator* D. & K.



49. *Culex secutor* Theo.

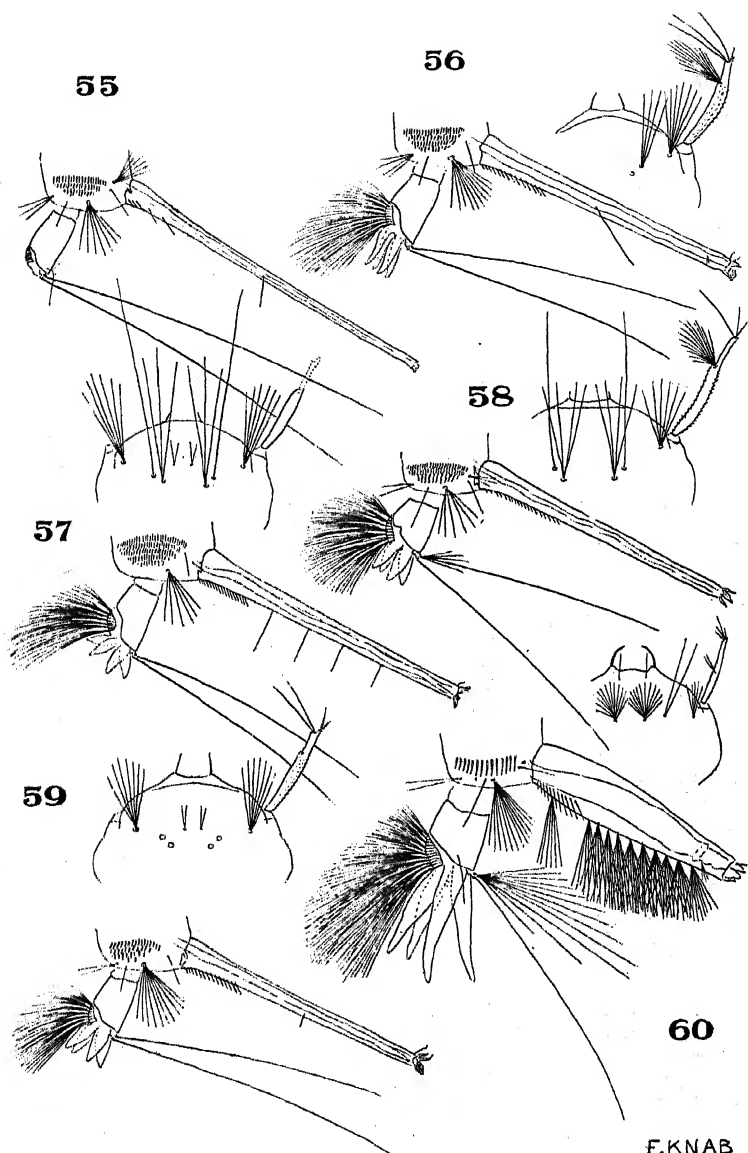
51. *C. carcinophilus* D. & K.

53. *C. vector* D. & K.

50. *C. lamentator* D. & K.

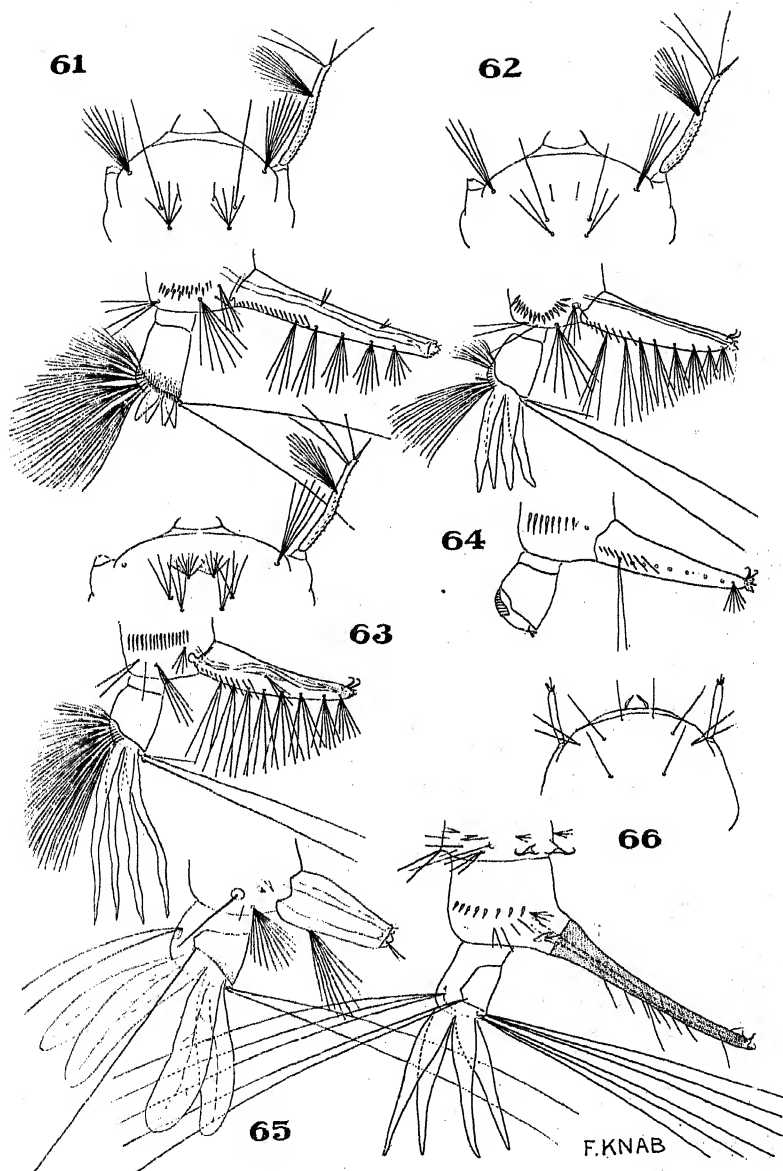
52. *C. daumasturus* D. & K.

54. *C. rejector* D. & K.



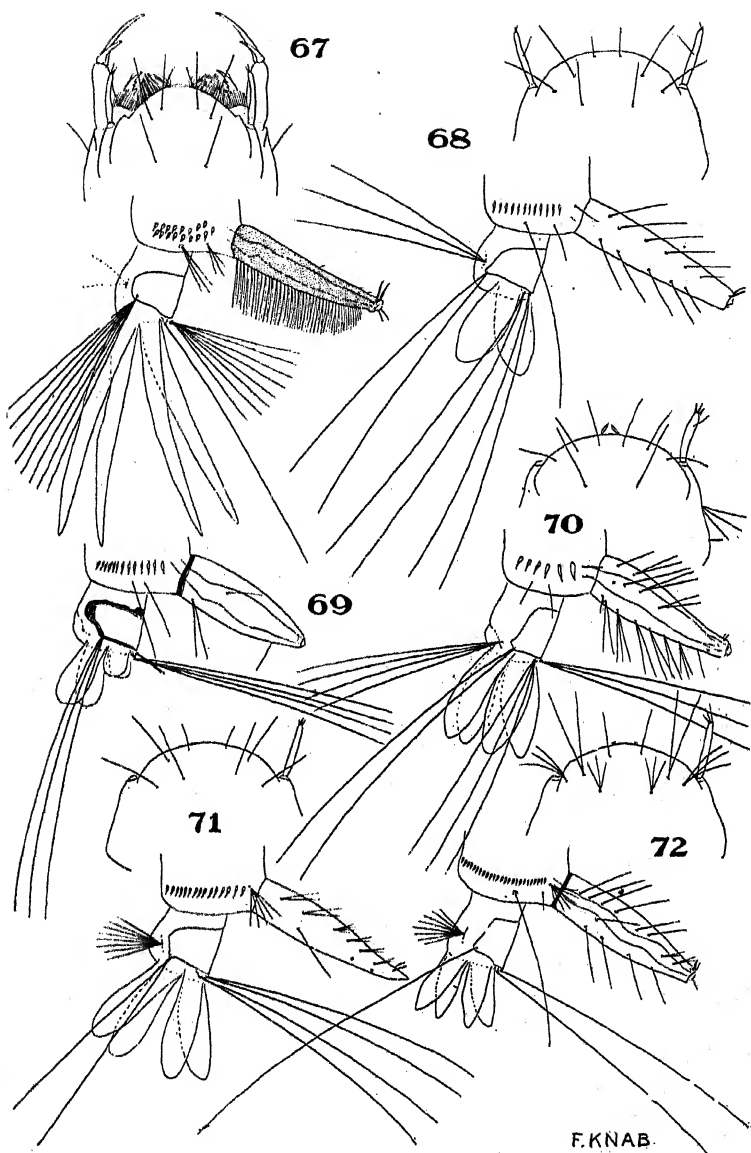
55. *Culex inimitabilis* D. & K.
 57. *C. restrictor* D. & K.
 59. *C. divisor* D. & K.

56. *C. conservator* D. & K.
 58. *C. latisquamma* Coq.
 60. *Mochlostyrax urichii* Coq.



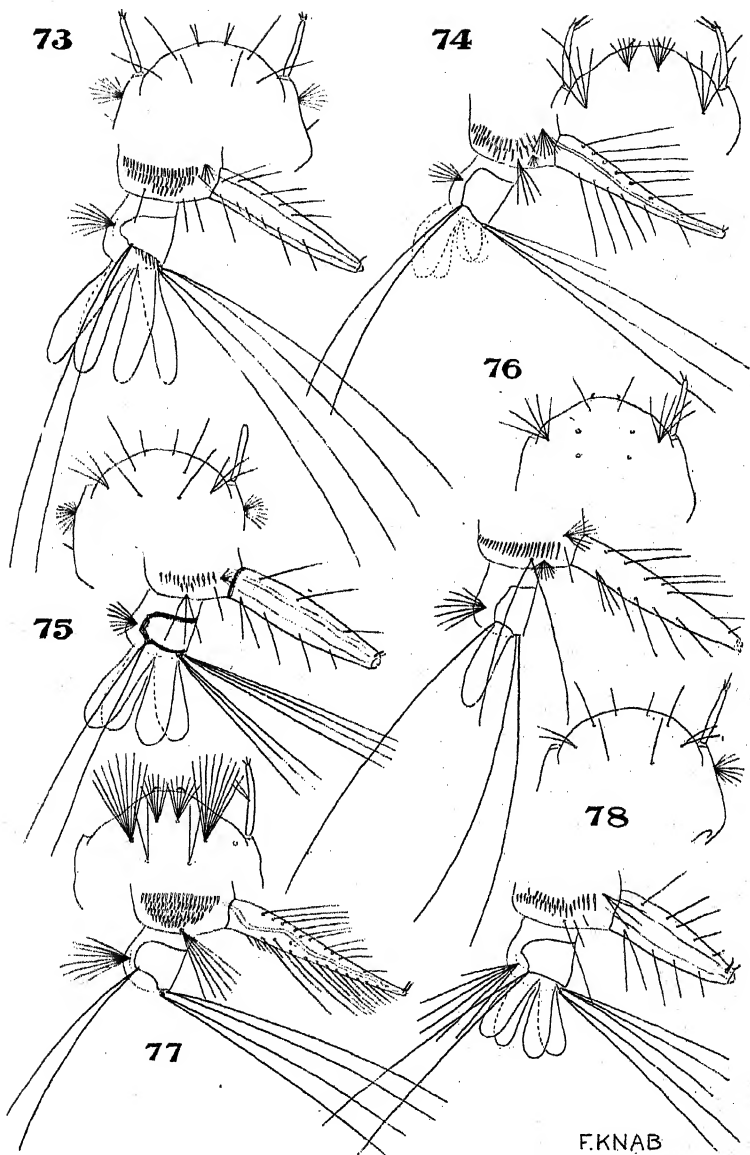
61. *Mochlostyrax erraticus* D. & K.
 63. *M. caudelli* D. & K.
 65. *Joblotia niveipes* Theob

62. *M. pilosus* D. & K.
 64. *M. cubensis* D. & K.
 66. *Sabethoides undosus* Coq.



67. *Lesticocampa lunata* Theo.
 69. *W. asullepta* Theo.
 71. *W. grayii* Theo.

68. *Wyeomyia smithii* Coq.
 70. *W. durhami* Theo.
 72. *W. ochrura* D. & K.



FKNAB

73. *Wyeomyia ulocoma* Theo.
 75. *W. aporonoma* D. & K.
 77. *W. autocratica* D. & K.

74. *W. longirostris* Theo.
 76. *W. telestica* D. & K.
 78. *W. hemisagnosta* D. & K.

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